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License Renewal Application
Review, 2006

JREG-1437, Supplement 29
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Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 29

Regarding
Pilgrim Nuclear Power Station

Final Report – Appendices

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
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Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 29

Regarding
Pilgrim Nuclear Power Station

Final Report – Appendices

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Division of License Renewal
Office of Nuclear Reactor Regulation
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Abstract

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of renewing nuclear power plant operating licenses (OLs) for a 20-year period in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, and codified the results in 10 CFR Part 51. In the GEIS (and its Addendum 1), the staff identified 92 environmental issues and reached generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted by Entergy Nuclear Operations, Inc. (Entergy), a subsidiary of Entergy Corporation, to the NRC to renew the OL for Pilgrim Nuclear Power Station (PNPS) for an additional 20 years under 10 CFR Part 54. This SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

Regarding the 69 issues for which the GEIS reached generic conclusions, neither Entergy nor the staff has identified information that is both new and significant for any issue that applies to PNPS. In addition, the staff determined that information provided during the scoping process was not new and significant with respect to the conclusions in the GEIS. Therefore, the staff concludes that the impacts of renewing the OL for PNPS would not be greater than impacts identified for these issues in the GEIS. For each of these issues, the staff's conclusion in the GEIS is that the impact would be of SMALL[(a)] significance (except for collective off-site radiological impacts from the fuel cycle and high-level waste and spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, those that apply to PNPS are addressed in this SEIS. For each applicable issue, the staff concludes that the significance of the potential environmental impacts of renewal of the OL would be SMALL, with the exception of marine aquatic resources. Due to entrainment and impingement, the continued operation of the cooling water system would have MODERATE[(b)] impacts on the local winter flounder (*Pseudopleuronectes americanus*) population, and the Jones River population of rainbow smelt (*Osmerus mordax*).

(a) Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

(b) Environmental effects are sufficient to alter noticeably but not to destabilize important attributes of the resource.

Abstract

Continued operation of the cooling water system would have SMALL to MODERATE impingement and entrainment impacts on other marine aquatic species as well. Cumulative impacts on the local winter flounder population and Jones River population of rainbow smelt would be MODERATE, and cumulative impacts on other marine aquatic species would be SMALL to MODERATE.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewal for PNPS are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Entergy; (3) consultations with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

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Abbreviations/Acronyms

°	degree(s)
µm	micron(s)
ac	acre(s)
AC	alternating current
ACC	averted cleanup and decontamination costs
ADS	automatic depressurization system
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
AOC	averted off-site property damage costs
AOE	averted occupational exposure
AOG	augmented off-gas
AOSC	averted on-site cost
APE	averted public exposure
ASME	American Society of Mechanical Engineers
ASMFC	Atlantic States Marine Fisheries Commission
ATWS	anticipated transient without scram
BA	biological assessment
BRW	boiling water reactor
BTU	British thermal unit(s)
BWROG	boiling water reactor owners group
C	Celsius
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CAPB	collapsed accident progression bins
CCDP	conditional core damage probabilities
CDF	core damage frequency
CDS	Comprehensive Demonstration Study
CET	containment event tree
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
cfs	cubic foot (feet) per second
Ci	curie(s)
cm	centimeter(s)
CO	carbon monoxide
CO_2	carbon dioxide
COE	cost of enhancement
CST	condensate storage tanks
CWA	Clean Water Act

DBA	design-basis accidents
DC	direct current
DCH	direct containment heating
delta T	change in temperature
DFO	Department of Fisheries and Oceans
DMR	discharge monitoring report
DO	dissolved oxygen
DOE	U.S. Department of Energy
DSM	demand side management
DTV	direct torus vent
EA	environmental assessment
ECCS	emergency core cooling system
EDG	emergency diesel generator
EEZ	exclusive economic zone
EFH	essential fish habitat
EIA	Energy Information Administration (of DOE)
EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EN-EV	environmental review and evaluation procedure
Entergy	Entergy Nuclear Operations, Inc.
EOP	emergency operating procedure
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbons
EPRI	Elecrtical Power Research Institute
ER	Environmental Report
ESA	Endangered Species Act of 1976, as amended
ETE	evacuation time estimate
F	Fahrenheit
FES	Final Environmental Statement
FIVE	fire-induced vulnerability evaluation
FMP	fishery management plan
fps	foot (feet) per second
FR	*Federal Register*
FSAR	Final Safety Analysis Report
ft	foot (feet)
FWS	U.S. Fish and Wildlife Service
fy	fiscal year

GL	generic letter
GARM	Groundfish Assessment Review Meeting
GEIS	*Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437*
GIS	geographic information system
gpm	gallon(s) per minute
HAPC	habitat area of particular concern
HCLPF	high confidence low probability of failure
HLW	high-level waste
hp	horsepower
HPCI	high pressure coolant injection
ICRP	International Commission on Radiological Protection
in.	inch(es)
IPE	individual plant examination
IPEEE	individual plant examination external events
ISLOCA	interfacing system LOCA
km	kilometer(s)
kV	kilovolt(s)
kW	kilowatt(s)
kWh	kilowatt hour(s)
L	liter(s)
LLRWSF	low level radwaste storage facility
LOCA	loss of coolant accident
LOOP	loss of off-site power
LPCI	low pressure coolant injection
m	meter(s)
m/s	meter(s) per second
mA	milliampere(s)
MA DEM	Massachusetts Department of Environmental Management
MAAP	modular accident analysis program
MACCS2	MELCOR Accident Consequence Code System 2
MAFMC	Mid-Atlantic Fishery Management Council
MassGIS	Massachusetts Geographic Information System
MBDS	Massachusetts Bay Disposal Site
MCC	motor control centers
MDEP	Massachusetts Department of Environmental Protection

MDFW	Massachusetts Division of Fisheries and Wildlife
MDMF	Massachusetts Division of Marine Fisheries
MDPH	Massachusetts Department of Public Health
MEOEA	Massachusetts Executive Office for Environmental Affairs
mg/L	milligram(s) per liter
MHC	Massachusetts Historical Commission
mi	mile(s)
min	minute(s)
MISER	Massachusetts Institute for Social and Environmental Research
mL	milliliter(s)
MLW	mean low water
mm	millimeter(s)
mrem	millirem(s)
MRI	Marine Research, Inc.
MSA	Magnuson-Stevens Act
MSIV	main steam isolation valve
MSL	mean sea level
MTU	metric ton of uranium
MWd	megawatt-days
MW(e)	megawatt(s) electric
MW(h)	megawatt hour(s)
MWRA	Massachusetts Water Resource Authority
MW(t)	megawatt(s) thermal
NAFO	Northwest Atlantic Fisheries Organization
NAS	National Academy of Sciences
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act of 1969, as amended
NESC	National Electric Safety Code
NHESP	Massachusetts Natural Heritage and Endangered Species Program
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxide(s)
NOAA	National Oceanic and Atmospheric Administration
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NPSH	net positive suction head
NRC	U.S. Nuclear Regulatory Commission

OCPC	Old Colony Planning Council
ODCM	Offsite Dose Calculation Manual
OL	operating license
PAH	polycyclic aromatic hydrocarbon
PCB	polychloronated biphenyl
PDS	plant damage state
PGA	peak ground acceleration
PILOT	payments in lieu of taxes
$PM_{2.5}$	particulate matter, 2.5 microns or less in diameter
PM_{10}	particulate matter, 10 microns or less in diameter
PNPS	Pilgrim Nuclear Power Station
ppm	parts per million
ppt	parts per thousand
PSA	probabilistic safety assessment
psi	pound(s) per square inch
RAI	request for additional information
RAMAS	risk analysis management alternative system
RBCCW	reactor building closed cooling water
RCIC	reactor coolant injection cooling
RCRA	Resource Conservation and Recovery Act
REMP	radiological environmental monitoring program
REWD	Radioactive Effluent and Waste Disposal Report
RHR	residual heat removal
ROW	right-of-way
RPC	replacement power costs
RPV	reactor pressure valve
RRW	risk reduction worth
s	second(s)
SAFE	Stock Assessment and Fishery Evaluation
SAMA	severe accident mitigation alternative
SAR	Safety Analysis Report
SARC	Stock Assessment Review Committee
SBO	station blackout
SCR	selective catalytic reduction
SEIS	supplemental environmental impact statement
SER	Safety Evaluation Report
SGTS	standby gas treatment system
SLC	standby liquid control

SMHS	Southeastern Massachusetts Health Study
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
SPRA	seismic probabilistic risk assessment
SRV	steam release valve
SSB	spawning stock biomass
SSW	salt service water
Sv	sievert(s)
TBCCW	turbine building closed cooling water
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
TRC	total residual chlorine
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USI	unresolved safety issue
V	volt(s)
VDC	volts direct current
VIMS	Virginia Institute of Marine Science
yr	year(s)

Appendix A

Comments Received on the Environmental Review

Appendix A

Comments Received on the Environmental Review

Part I - Comments Received During Scoping

On April 14, 2006, the U.S. Nuclear Regulatory Commissions (NRC) published a Notice of Intent in the *Federal Register* (Volume 71, page 19554) to notify the public of the staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, regarding the renewal application for the Pilgrim Nuclear Power Station (PNPS) operating license. The plant-specific supplement to the GEIS will be prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), Council on Environmental Quality (CEQ) guidelines, and Title 10 of the Code of Federal Regulations (CFR) Part 51. As outlined by NEPA, the NRC initiated the scoping process with the issuance of the *Federal Register* Notice of Intent. The NRC invited the applicant; Federal, State, local, and tribal government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at the scheduled public meetings and/or submitting written suggestions and comments no later than June 16, 2006.

The scoping process included two public scoping meetings, which were held at the Radisson Hotel Plymouth Harbor Ballroom, 180 Water Street, Plymouth, Massachusetts, on May 17, 2006. The NRC issued press releases, placed local newspaper ads, and distributed flyers locally. Approximately 160 people attended the meetings. Both sessions began with NRC staff members providing a brief overview of the license renewal process and the NEPA process. Following the NRC's prepared statements, the meetings were open for public comments. Thirty-three attendees provided either oral comments or written statements that were recorded and transcribed by a certified court reporter. The transcripts of the meetings can be found as an attachment to the meeting summary, which was issued on July 13, 2006. The meeting summary is available for public inspection in the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams/web-based.html. The meeting summary as well as all written comments can be found in ADAMS under Accession Nos. ML061700040 and ML062400368, respectively. In addition to the comments received during the public meetings, six comment letters and one e-mail message were received by the NRC in response to the Notice of Intent.

At the conclusion of the scoping period, the NRC staff and its contractor reviewed the transcripts and all written material to identify specific comments and issues. Each set of comments from a given commenter was given a unique identifier (Commenter ID), so that each set of

comments from a commenter could be traced back to the transcript or letter by which the comments were submitted. Several commenters submitted comments through multiple sources (e.g., afternoon and evening scoping meetings, and/or written comments). Table A.1 identifies the individuals who provided comments applicable to the environmental review and the Commenter ID associated with each person's set(s) of comments. For oral comments, the individuals are listed in the order in which they spoke at the public meeting.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by the commenters. The comments fall into one of the following general groups:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related federal actions.

- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the PNPS license renewal application.

- Questions that do not provide new information.

- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations related to license renewal. These comments typically address issues such as the need for power, emergency preparedness, security, current operational safety issues, and safety issues related to operation during the renewal period.

Comments applicable to this environmental review and the NRC staff's responses are summarized in this appendix. The parenthetical identifier after each comment refers to the comment set (Commenter ID). This information, which was extracted from the PNPS Scoping Summary Report, is provided for the convenience of those interested in the scoping comments applicable to this environmental review. The comments that are general or outside the scope of the environmental review for PNPS are not included here. More detail regarding the disposition of general or inapplicable comments can be found in the scoping summary report. The ADAMS accession number for the PNPS Scoping Summary Report is ML062710517.

Table A-1. Individuals Providing Comments During Scoping Comment Period

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
PNPS-A	Mary Lampert	Town of Duxbury Nuclear Advisory Committee	Afternoon Scoping Meeting
PNPS-B	Keith Maxwell	Local Resident	Afternoon Scoping Meeting
PNPS-C	Corwne Young	District Representative for Congressman Bill Delahunt	Afternoon Scoping Meeting
PNPS-D	Mark Sylvia	Town Manager, Plymouth	Afternoon Scoping Meeting
PNPS-E	Alba Thompson	Citizen, Plymouth	Afternoon Scoping Meeting
PNPS-F	Joyce McMahon	Massachusetts Affordable Reliable Electricity Alliance (Mass AREA)	Afternoon Scoping Meeting
PNPS-G	Pine du Bois	Jones River Watershed Association	Afternoon Scoping Meeting
PNPS-H	Robert Ruddock	Associated Industries in Massachusetts (AIM)	Afternoon Scoping Meeting
PNPS-I	Jim O'Connell	Citizen, Chatham	Afternoon Scoping Meeting
PNPS-J	Frank Collins	Precinct Six Town Meeting Member	Afternoon Scoping Meeting
PNPS-K	Rick Anderson	Carpenters Local 624	Afternoon Scoping Meeting
PNPS-L	Andre Martecchini	Selectman from the Town of Duxbury	Evening Scoping Meeting
PNPS-M	Mary Lampert	Massachusetts Public Interest Research Group (Mass PIRG)	Evening Scoping Meeting
PNPS-N	Mary Lampert	Pilgrim Watch	Evening Scoping Meeting
PNPS-O	Mary Ellen Burns	Town Meeting Representative, Precinct 13, W. Plymouth	Evening Scoping Meeting
PNPS-P	Jeff Berger	Chairman, Nuclear Matters Committee, Town of Plymouth	Evening Scoping Meeting
PNPS-Q	Becky Chin	Vice Chairman, Duxbury Nuclear Advisory Committee	Evening Scoping Meeting
PNPS-R	Peter Curley	Local Resident	Evening Scoping Meeting
PNPS-S	Joyce Mahon	Communications Director, Mass AREA	Evening Scoping Meeting
PNPS-T	Arthur Powers	Local Resident	Evening Scoping Meeting
PNPS-U	Leonard Curcuru	Local Resident, Mass AREA Member	Evening Scoping Meeting
PNPS-V	William Stone	Local Resident	Evening Scoping Meeting
PNPS-X	Sandra Woods	Local Resident	Evening Scoping Meeting
PNPS-Y	Janet Humes	Local Resident	Evening Scoping Meeting
PNPS-Z	Bob Smith	Local Resident	Evening Scoping Meeting
PNPS-AA	Jerry Benezra	Local Resident	Evening Scoping Meeting
PNPS-AB	Tom Belcher		Written Comments
PNPS-AC	Mary Lampert	Pilgrim Watch	Written Comments
PNPS-AD	Frank Gorkey	Energy Advocate, Mass PIRG	Written Comments
PNPS-AE	Sheila Hollis	Attorney for Town of Plymouth	Written Comments

Table A-1. (contd)

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
PNPS-AF	Rebecca Chin	Vice Chairman, Duxbury Nuclear Advisory Committee	Written Comments
PNPS-AG	Elizabeth Huggins	Director, Office of Environmental Review, U.S. Environmental Protection Agency	Written Comments
PNPS-AH	Diane Curran	Harmon, Curran, Spielberg & Eisenberg, LLP; For the Office of the Massachusetts Attorney General	Written Comments

Comments in this section are grouped in the following categories:

A.1.1 Comments Concerning Water Quality
A.1.2 Comments Concerning Aquatic Ecology
A.1.3 Comments Concerning Socioeconomic Impacts
A.1.4 Comments Concerning Human Health
A.1.5 Comments Concerning Uranium Fuel Cycle and Waste Management
A.1.6 Comments Concerning Postulated Accidents
A.1.7 Comments Concerning Alternative Energy Sources
A.1.8 Comments Concerning Monitoring Programs

A.1 Comments and Responses

A.1.1 Comments Concerning Water Quality

Comment: Given the plant's coastal location, the importance of the coastal waters to the region's economy, and the use of the coastal water for recreational purposes, it is essential to confirm that Pilgrim will not violate applicable water quality standards during the renewal period and jeopardize aquatic life or the health of those using the waters. (PNPS-AE)

Comment: This plant has been over here for 20 years, the water had been coming, the water has been going, and there has got to be a heck of a lot more water in that ocean out there than what they are putting out every day to filter it out. (PNPS-T)

Response: *The comments are related to water quality issues. Water quality, water use, and other water issues were evaluated in the GEIS and determined to be Category 1 issues. The*

comments provide no new and significant information on water quality; therefore, the comments will not be evaluated further. Water quality will be discussed in Chapters 2 and 4 of the SEIS.

Comment: Marine impact is a huge area and it doesn't make any sense to say, well, let's not consider it because they have made an application to EPA for their water discharge permit, which is overdue, so, hence, they can rely on 1996 data that they have provided and got a permit back then. We are talking about 2012. It would be like myself saying, you know, I've applied for a license to drive so, therefore, I have the right to drive and nobody should question me, so that doesn't make any sense. (PNPS-A)

Comment: In the ER, Entergy claims to be in "continued compliance with applicable [Clean Water Act "CWA"] standards." Entergy states that the plant received water quality certifications from the relevant Massachusetts authorities in the early 1970s (as set forth in Attachment A to the ER) and the National Pollutant Discharge Elimination System ("NPDES") permit for Pilgrim reflects continued compliance with relevant CWA standards, excerpts of which are also included in Attachment A. The NPDES permit included in Attachment A, however, appears to have expired in 1996. While Entergy states elsewhere in the ER that USEPA Region I, the NPDES permitting authority for Massachusetts, is reviewing an Entergy application for renewal of the NPDES permit with respect to Pilgrim (see ER, Chapter 4.2.5), Entergy should be required to provide further evidence (besides excerpts from Attachment A) documenting its alleged continued compliance with the CWA standards and/or the conclusions of USEPA Region I regarding the plant's continued compliance with appropriate CWA standards. (PNPS-AE)

Comment: EPA is currently reviewing Entergy's application for issuance of its NPDES permit. While we encourage the NRC to fully analyze the issues described in this letter in its EIS for the twin purposes of satisfying NEPA and supporting appropriate licensing decisions under the Atomic Energy Act and NRC regulations, the EIS should not draw conclusions regarding whether changes to the plant operations or existing NPDES permit conditions would be necessary or appropriate to satisfy the Clean Water Act, as responsibility for those determinations rests with the EPA. (PNPS-AG)

Response: *The comments are noted. The NRC does not have authority over matters concerning discharge permits or compliance with the Clean Water Act. To operate PNPS, NRC regulations require Entergy to comply with the Clean Water Act and its associated requirements imposed by the USEPA Region I, as part of the NPDES permit. The SEIS will evaluate the impacts related to impingement and entrainment of organisms, discharges to the aquatic environment, the thermal plume, and other potential or actual aquatic impacts. In addition, the status of PNPS's NPDES permit application will be discussed in Chapters 2 and 4 of the SEIS.*

Comment: In the past, Pilgrim Station has needed to dredge the areas in front of its cooling water intake to prevent siltation from interfering with plant operations. The dredged material must then be disposed of or used in an appropriate way. There have been issues, however, regarding contamination of that dredged material, presumably as a result of the plant's wastewater discharges. While these issues were resolved for past dredging, it would be appropriate for the EIS to assess whether the facility will have future dredging needs and what environmental issues would be associated with any such dredging. The U.S. Army Corps of Engineers and EPA are both likely to have information on this topic in their files. (PNPS-AG)

Response: *The comment is noted. The impacts of dredging will be evaluated and incorporated, as appropriate, in Chapters 2 and/or 4 of the SEIS.*

Comment: There are no monitoring wells to test for radioactive contaminated water flowing off-site. The water on-site is not used for drinking; therefore the facility is not required by regulation to have monitoring wells.

However radioactive waste is buried onsite and leaks from buried pipes and tanks and from other components can leak into the ground and migrate, as occurred at Braidwood and other sites discussed in Pilgrim Watch's Motion to Intervene. Absent monitoring wells, there is no reasonable assurance that radioactive material will not, or has not, migrated into Cape Cod Bay, Duxbury Bay, Kingston Bay and/or Plymouth Bay. Pilgrim's original Environmental Impact Statement makes it clear that wells must be placed along the shoreline of Cape Cod Bay.

Surface topography is such that drainage from the Station is seaward and surface water will not leave the property otherwise. Subsurface water follows the surface topography, resulting in overall movement of water toward the Bay.

Also they should be placed at any other appropriate on-site locations [such as property along and off the Access Road] to protect workers, inadvertent intruders and prevent buried radionuclides from being uncovered and airborne and affecting the neighborhood. (PNPS-AC)

Comment: The potential for tritium leaks at the Pilgrim plant poses a unique hazard to the public health of the residents if the Town and neighboring areas because the Town and it's neighbor, Carver, Massachusetts, rely almost totally on the Plymouth-Carver aquifer (the "Aquifer") for drinking water, and the Aquifer partially supplies neighboring communities as well. The Aquifer covers approximately 140 square miles in area with an estimated 500 billion gallons of potable water. Composed of saturated glacial sand and gravel, the Aquifer ranges in depth from 20 feet to over 200 feet. The Aquifer is designated by the Environmental Protection Agency as a "Sole Source Aquifer" - that is, one which provides at least fifty percent of the water supply given to a community - it is the second largest Aquifer in Massachusetts and one of only 70 Sole Source Aquifers in the United States.

Of course, while the Aquifer has large reserves, it is not a closed system. The Aquifer is recharged through the natural seepage of precipitation, septic system discharges, and agricultural water. Accordingly, any leakage of tritiated water from the Pilgrim plant into the groundwater could infiltrate the Aquifer, and thereby contaminate the drinking water supplies for the Town as well as for the heavy agricultural use of the Aquifer, with potentially serious health implications for those consuming the water or the farm products grown with it.

The Aging Management Plan for Pilgrim provides that underground pipes and tanks will be inspected when excavated during maintenance and that a focused inspection will be performed within ten years unless an opportunistic inspection occurs within this period. However, in light of the increasing frequency of leakage events at analogous nuclear plants in recent years, a more frequent and thorough inspection of all components that contain radioactive water at the Pilgrim plant is warranted to avoid the risk of leakages going undetected and to better safeguard the public health of the residents of the Town and neighboring areas. (PNPS-AE)

Comment: A number of leaks in recent years from underground pipes and tanks releasing tritiated water from spent fuel pools into the groundwater gives rise to concerns about the potential for the similar release if radioactive materials at the Pilgrim plant. Leaks from a spent fuel pool are not uncommon. Indeed, there were leaks reported from three nuclear power plants in 2005. The Indian Point plant in New York (also owned by Entergy) experienced a tritium leakage into groundwater likely due to a crack in the spent fuel pool concrete support. The Braidwood nuclear power station in Illinois also has leaking tritium and its owners, Exelon Nuclear, recently agreed to a court order to force it to begin clean-up. The NRC also was informed that the spent fuel pool at the Connecticut Yankee plant in Haddam, Connecticut was leaking into the ground at the rate of several gallons per day. Other instances of groundwater contamination have been reported at nuclear facilities in Arizona, California, and Florida. The NRC itself has acknowledged the severity of the problem associated with tritium contamination of groundwater associated with equipment degradation and is assessing what changes, if any, are needed to the agency's rules and regulations to better protect the public health and safety. (PNPS-AE)

Comment: Older plants, such as Pilgrim, are more likely to experience corrosion and leakage problems that can result in the release of amounts of radioactive materials into the groundwater. Exposure to radiation from any such leaks represents a threat to human health and it is a violation of NRC regulations. Adequate inspection and monitoring of and systems and components that carry radioactive water should be a critical part of Pilgrim's Aging Management Plan to minimize the likelihood of leakage and associated danger to the safety and welfare of the public. (PNPS-AE)

Response: *Although NRC regulations require licensees to make surveys, as necessary, to evaluate the potential hazard of radioactive material released in order to assess doses to*

members of the public and workers, recent discoveries of releases at other plants indicate that undetected leakage to groundwater from facility structures, systems, or components can occur resulting in unmonitored and unassessed exposure pathways to members of the public.

The NRC has identified several instances of unintended tritium releases, and all available information shows no threat to the public. Nonetheless, the NRC is inspecting each of these events to identify the cause, verify the impact on public health and safety, and review licensee plans to remediate the event. The NRC also established a lessons learned task force to address inadvertent, unmonitored liquid radioactive releases from U.S. commercial nuclear power plants. This task force reviewed previous incidents to identify lessons learned from these events and determine what, if any, changes are needed to the regulatory program. Detailed information and updates on these liquid releases can be found on the NRC public website at http://www.nrc.gov/reactors/operating/ops-experience/grndwtr-contam-tritium.htm. These comments provide no new and significant information and, therefore, will not be evaluated further.

A.1.2 Comments Concerning Aquatic Ecology

Comment: And also, I would hope that you and EPA DEP would work together to come up with a number of how many fish, what is it, per acre, can be damaged, as opposed to a more general statement of what is or is not acceptable. (PNPS-A)

Comment: EPA recommends that the EIS use documented impacts to the marine environment from the thirty-four years that Pilgrim Station has been in operation to evaluate the direct, indirect, and cumulative impacts associated with the requested twenty year license extension. (PNPS-AG)

Comment: It also affects the plant life in the sea that supports nursery habitats. We are seeing, through Kingston, Duxbury, Plymouth bays, that our eel grass beds are vanishing. We don't necessarily know the reason why and we are not in a position to blame the nuclear power station, but I can say that those kinds of impacts are real, are logical and should be looked at and addressed with a great deal of diligence, especially in view of what Mary was saying before. (PNPS-G)

Comment: I'm sure the NRC doesn't know, if they are not from this area, but most of the people in the room do know that there is a northeast fishing crisis going on, the fishermen cannot go fishing, there is no cod, there is no haddock, there is no flounder out there.

And this has nothing to do with the nuclear power plant, it has to do with the management of the species but, anyway, we thought we would try and develop the means to replace the fish in

the oceans, to allow the fishermen to go fishing for more than 50, or 48 or 30 days a year, which is what they are at right now. (PNPS-I)

Comment: And when they proposed the building of the plant, Boston Edison funded a study and it was funded by Boston Edison and carried out by the Division of Marine Fisheries, and they studied what impact the warmer water had on lobsters for a period of three years before the plant opening and probably about three years after it opened, and the conclusion of that study was that lobsters came in a little earlier in the spring and stayed there a little later in the fall, with the warm water. (PNPS-J)

Comment: The area of marine and environmental concerns, the Town of Duxbury and I know the Town of Plymouth, we have a thriving, and aquaculture and marine fisheries business going on, and not to mention the recreational sailing, and fishing and everything. We are very concerned. As we see today, we've had to close the bay, up and down the coast, because of the flooding and rain. What is the effect of the heat of the discharge that's being dumped into the bay? How does that effect our environment for our marine industries? (PNPS-L)

Response: *The comments are related to aquatic ecology. Aquatic ecology issues will be discussed in Chapters 2 and 4 of the SEIS.*

Comment: To identify species of interest, the EIS should determine the presence of particular species within general proximity of the project location. The EIS should include species for which Essential Fish Habitat under the Magnuson-Stevens Act is listed near the proposed project location. The EIS should cross-reference this list with NOAA's ECOMON and MARMAP datasets with information from stations around the project area. A final list of species of interest should be developed in consultation with EPA, NMFS, and Massachusetts Department of Marine Fisheries. The EIS should also assess any potential impacts to endangered species from Pilgrims Station's operations. (PNPS-AG)

Comment: The EIS should address relevant issues under other applicable laws, such as compliance with the Endangered Species Act, the essential fish habitat provisions of the Magnuson-Stevens Act, and the Coastal Zone Management Act. (PNPS-AG)

Response: *In order to determine the potential species of interest to be evaluated in the SEIS, the NRC has consulted with the US Environmental Protection Agency (USEPA), US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Massachusetts Department of Marine Fisheries (MA DMF). These agencies have provided information on specific species of interest that should be addressed in the impact assessment. Regarding the essential fish habitat provisions of the Magnuson-Stevens Act, NRC has consulted with the Habitat Protection Division of the NMFS. Based on discussions with the NMFS and review of the databases described in the comment, a list of species to be addressed in the analysis will*

be developed and discussed in the Essential Fish Habitat Assessment and in Chapter 4 of the SEIS.

Regarding endangered species, the NRC has consulted with the US FWS and the NMFS-Protection Resources Division regarding potential impacts to terrestrial and aquatic species. The results of this assessment will be reported in a Biological Assessment (as required by Section 7 of the Endangered Species Act) and in Chapter 4 of the SEIS.

To evaluate the effects of the proposed action as it relates to the Coastal Zone Management Act, the NRC has consulted with the Massachusetts Office of Coastal Zone Management (MA CZM). The analysis of PNPS's Coastal Zone Management Federal Consistency Certification will be addressed in Chapters 2 and 4 of the SEIS.

Comment: Other issues were mitigation, adding, you know, fish to the bay to make up for those that happen to get chopped up in the system, do they breed with native stock? Does that make a difference? (PNPS-A)

Comment: Evaluation of the effectiveness of various mitigation strategies needs to be performed with stakeholder input. Stocking: We understand that Entergy has contracted with a Cape Cod company to provide substitute stock into Cape Cod Bay. However, we understand that these are a different genetic grouping and that they do not breed with the native stocks. If this is the case, then this method does not solve the problem. An analysis of this issue is required. (PNPS-AC)

Comment: The applicant supports an on-going winter flounder hatchery study and claims that the hatchery activities for winter flounder are providing stock enhancement that can be relied upon as an effective form of mitigation for entrainment losses of the wild winter flounder population. If this remains a reasonably feasible option for Pilgrim Station, the EIS should explore this issue more fully. At present, we are not aware of convincing evidence that the stocked fish survive to reproduce in these habitats. Moreover, there has not been a study of the potential impacts of hatchery-related fish on the native population. The genetic and behavioral implications should also be studied in order to determine if this hatchery is a true mitigation mechanism for winter flounder or simply another ecological disturbance. (PNPS-AG)

Comment: Entergy, the owners of the plant, is also involved in a number of valuable environmental initiatives, perhaps one of the most interesting is that they did a great deal of study in the waters of Cape Cod and the indigenous fish populations. That result, excuse me, that resulted in their working with Llennoco, a fish hatchery in Chatham, down on the Cape, which every year hatches, rears and releases 25,000 winter flounder into Plymouth Harbor for the benefit of the state and the local fishing industry. Entergy also contributes a large amount

of money, in the form of grants, to several local environmental groups working with aquatic and other environmental issues. (PNPS-F)

Comment: One of the previous speakers concerns was that the fish that were added back, she was wondering whether they were normal and we find, and seven years of experience has proven, that they are normal, just like the every day fish, the young of the native fish that are out there now. Not only did we find that they were normal but we found out that they flourish out there ... And I'm again oversimplifying but we found that now that we found we can do it, we can also do it with cod and we can do it with haddock. In other words, we are on the verge of actually being able to make a difference and we are doing this because Entergy actually helped us, they supported us and helped us build this pilot facility for their own reasons, I'm sure. (PNPS-I)

Response: *The comments are related to mitigation of potential impacts to winter flounder populations through the addition of hatchery-reared fish to the local population. This issue will be discussed in Chapter 4 of the SEIS.*

Comment: As far as impingement goes, fish that are smacked against the grate and then removed, have they been permanently damaged so that they do not have a survival affect, has that been studied? Would we be better off having a grate at the mouth of the canal that might decrease the number of fish impinged or increase their survivorability and, at the same time, have a security effect by catching any explosive that a bad guy wanted to put up the intake canal? (PNPS-A)

Comment: And I think you should look carefully at a memo prepared by Jerry Szal, S-Z-A-L, of the DEP, specifically on the marine effect of Pilgrim on our environment, the once through cooling system. In it, he mentions some very important items. One is it appropriate to average the temperature discharge or is it more important to be required to have an instantaneous discharge so the maximum number is always adhered to? (PNPS-A)

Comment: And I think that what Mary Lampert said about adjusting the screening and the intake makes a lot of sense in term of trying to mitigate further the ongoing damage in the intake structure to those populations. (PNPS-G)

Comment: Impingement: Because impinged fish from the intake screens are shunted back into the intake, there is a concern that these fish, weakened from impingement, will simply be re-impinged. Permitting and resource agencies should consider requiring an assessment of re-impingement rates to select species of concern. These studies should also assess the need to re-locate the discharge point for impinged fish in order to minimize re-impingement. (PNPS-AC)

Comment: Discharge Effects Thermal Discharge: Discharge temperature is now averaged over an hour; instantaneous measurement should be required.

Thermal backwash: In summary, during a thermal backwash, about 155,000 gpm of heated water (F) is sent into the intake embayment for a period of about 1.5-2 hrs. Studies to evaluate potential impacts of the thermal backwash have not been performed to the knowledge of DEP's Gerry Szal.°>105 (PNPS-AC)

Comment: Wet Land refurbishment or other unrelated environmental measure: These measures are all well and good but do not address the issue at hand. See following attachment, Marine Attachment Pilgrim Nuclear Power Station: review of intake and discharge effects to finfish - Technical Memorandum For The Record, Gerald M. Szal [Department Environmental Protection, MA.], August 30, 2005. (PNPS-AC)

Comment: Pilgrim Station operations have resulted in a range of impacts to marine life in Cape Cod Bay. Because the facility annually entrains large quantities of fish eggs and larvae and impinges large quantities of juvenile and adult fish, we recommend that the EIS pay particular attention to this impact of the plant's cooling system, especially with respect to winter flounder, Atlantic cod, and rainbow smelt. Winter flounder is a species of particular interest due to its commercial, recreational and ecological importance. Estimated of winter flounder age -3 adult equivalent losses due to entrainment and impingement as reported by Pilgrim in annual monitoring reports have ranged from <1% of the Cape Cod Bay population to almost 30% of the population annually. Entrainment and impingement losses of Atlantic cod and rainbow smelt are of particular concern as well. Atlantic cod have historically supported a large commercial fishery in New England, but their numbers have declined to the point that commercial fishing for this species has almost been completely eliminated in Massachusetts Bay. The EIS should discuss entrainment and impingement losses of Atlantic cod at Pilgrim Station within the context of a collapsed commercial fishery. Pilgrim Station also impinges rainbow smelt, whose numbers have plummeted due to problems such as the loss of spawning habitat. It is our understanding that Rainbow smelt are now being studies for potential listing as a threatened or endangered species under the Endangered Species Act. The entrainment and impingement losses of this species at Pilgrim Station should be assessed within that context. (PNPS-AG)

Comment: Pilgrim station currently controls macro-fouling by periodically re-routing heated condenser cooling water back through the system and out through each intake embayment separately. This process, called thermal backwashing, is preformed about four to five times per year at full thermal load and three to four times per year at 50% thermal load. Backwashing both sides of each condenser can take up to four hours within one day and the temperature may reach as high as 120F. EPA encourages the NRC to include an evaluation of the impacts of the thermal backwash on aquatic organisms in the EIS. (PNPS-AG)

Comment: It should also be noted that two fish kill events resulting from gas bubble disease occurred in the Station's discharge canal during the 1970's. Subsequently, Pilgrim was required to install a barrier net in the discharge canal to prevent fish from entering and residing there. However, in 1996 Pilgrim was allowed to remove the net because no significant fish kill events had occurred for some time. There also have been no documented large fish kill events since the net was removed. Nevertheless, there is a risk that a large year class of menhaden, for example, will detect the thermal plume of Pilgrim Station and possibly take residence in the plume or canal. This would once again subject fish to gas bubble disease. The EIS should consider options for preventing this impact when a strong year class is projected, including the possibility of requiring that Pilgrim Station deploy a barrier net during appropriate periods to reduce impacts and implement a biological surveillance program to effectively determine when the impact minimization measures should be triggered. (PNPS-AG)

Comment: EPA is concerned about repeated impingement events at Pilgrim Station. Historic data for Pilgrim shows high impingement numbers for several fish species including Atlantic silversides, Atlantic menhaden, blueback herring, grubby, alewife, Atlantic cod, and rainbow smelt. The majority of rainbow smelt impinged at Pilgrim Station are believed to have originated from the nearby Jones River population. However, without quantitative evaluation of the size of the Jones River population, it is not possible to fully assess the impact of Pilgrim Station The EIS should assess the potential impacts of impingement on all native fish species affected, as well as provide a discussion of potential measures that can be taken to reduce these impacts. (PNPS-AG)

Comment: This EIS should assess Pilgrim Station's current fish return system and document any problems with it. We currently recognize at least three shortcomings of the current fish return system that contribute to an increase on impingement mortality at Pilgrim. First, chlorinated service water from the intake is de-chlorinated and used to spray fish and debris from screens. There have been several documented occasions when the de-chlorination system failed to operate correctly and fish were subjected to a chlorinated salt-water spray. Second, the screens are normally only rotated once every 8- hour shift, thereby increasing the length of time that fish are held against the screens. Third, fish are returned back to the intake embayment of the Station, about 100 yards upstream of the intake structure, which may result in high re-impinging rates.

In response to these three issues, we believe the EIS should discuss the benefits of installing a chlorine measuring and malfunction system, evaluate the feasibility of continuous screen rotation and assess re-impingement rates and whether there may be a more appropriate relocation point for the fish return. In addition, the EIS should evaluate other options for improving the fish return system to minimize impingement mortality. (PNPS-AG)

Comment: The EIS should discuss reasonable alternative ways to reduce impingement, impingement mortality, entrainment and thermal discharges at the Pilgrim Station. Specifically, EPA supports thorough evaluation of (1) alternative protection technologies including substratum intake structure, various screening technologies (including wedgewire screens, fine-mesh barrier nets or screens (e.g., "Gunderbooms")), cooling towers, variable speed pumps, and fish return system upgrades; (2) alternative operational schemes including seasonal flow restrictions, continuous screen operation, scheduling plant outages to minimize environmental impacts and the installation of a chlorine measuring and malfunction notification system; and (3) potential mitigation measures. In assessing these alternatives, the EIS should not only evaluate their environmental ramifications, but should also address the nuclear power plant safety implications of the alternatives. (PNPS-AG)

Comment: The EIS should also assess the effects of the thermal plume on the marine environment, including effects on water quality and marine organisms. This analysis should consider possible acute and chronic effects to marine organisms, such as causing mortality, habitat avoidance, interrupted spawning, or increased prediction of threats, based on an evaluation of the temperatures at which effects on health and behavior of the relevant organisms may occur. Possible ecological effects should be considered (e.g., has warm water attracted non-native species that drive out the native species). Effects on the benthic community, including physical effects from scouring by the discharge, should also be addressed. Adverse benthic effects have been documented in the past, primarily from scouring, over an area of one to two acres. (PNPS-AG)

Comment: Pilgrim Station discharges a maximum of 510 million gallons per day (MGD) of heated non-contact condenser cooling water to Cape Cod Bay. Pilgrim's current National Pollutant Discharge Elimination System (NPDES) permit specifies a maximum daily temperature limit of 102F. The EIS should assess the scope of the thermal plume across the tidal cycle in terms of area and depth of the water body impacted, the amount of heat added to the water (in British Thermal Units) and the extent to which the discharge alters ambient water temperatures. (PNPS-AG)

Comment: Several other fish species, besides winter flounder, also suffer substantial entrainment losses at the Pilgrim facility. These include cunner, mackerel, menhaden, Atlantic cod and Atlantic herring. The EIS should assess the potential impacts of entrainment on all the native fish species affected, along with means to reduce these impacts, including the use of the alternate cooling water intake system technologies discussed below. (PNPS-AG)

Comment: In addition, we recommend that the EIS explore alternative modes of operation that would avoid and minimize environmental impacts associated with the current mode of operation. These impacts include effects on water quality and marine life from the facility's

pollutant discharges (e.g., any discharges of heat, chemicals, radionuclides, etc.) and withdrawals of water from Cape Cod Bay for cooling. (PNPS-AG)

Comment: There is apparently significant influence by the plant on the bay area, people that are familiar with the area do say that it is relatively barren. The problem that results from that and the raising of the temperature is that there are various impacts on the ecosystem that we are seeing today, for instance, in the ongoing concern about red tide. If our bay temperature rises, like, for instance, Mt. Hope Bay where Brayton Point, the Cole Power Station, has significantly raised the temperature of the bay, there is a lot of changing of the population to fish, the aquatic life in the system. We lose fish, like sturgeon, we lose the larger fish that we ourselves depend on for our survival and begin to have problems with algae, we begin to have problems with low oxygen levels. (PNPS-G)

Comment: We believe that you have to do much, much, much more examination of the impact of the heated water going into the bay than has been done and you have to do much, much more than have a hatchery for winter flounder. (PNPS-G)

Comment: Finally, the Pilgrim Plant's cooling system causes significant damage to the environment of Cape Cod Bay. Pilgrim uses a once through cooling system, taking in nearly one half billion gallons of water a day and setting it into the bay at 25 or more degrees hotter.

An additional 20 years of operations at Pilgrim, using this cooling system, could kill billions of aquatic plants and animals, this cooling system also violates Chapter 316B of the Federal Clean Water Act which requires the plant to use the best available technology to minimize environmental impact.

We believe that the plant must be held to the highest standards under the Clean Water Act and a closed cycle cooling system should be installed as soon as possible, and certainly before the license extension is granted. (PNPS-M)

Comment: Thermal discharge temperature is now averaged, there should be a cap and required instantaneous measurement. (PNPS-N)

Comment: The second comment from DEP was because impinged fish from the intake screens are shunted back into the intake, there is concern that these fish, weakened from impingement, will simply be reimpinged. Permitting the resource, permitting resource agencies should consider requiring an assessment of reimpingement rates to select species of concern. These studies should also assess the need to relocate the discharge point for impinged fish in order to minimize reimpingement. (PNPS-N)

Response: *The comments, in general, express concern regarding the impacts on aquatic organisms resulting from operation of the existing PNPS once-through cooling system. To operate PNPS, NRC Regulations require Entergy to comply with the Clean Water Act and its associated requirements imposed by USEPA Region I, as part of the NPDES permit. The SEIS will evaluate the impacts related to impingement and entrainment of organisms, discharges to the aquatic environment, the thermal plume, and other potential or actual aquatic impacts. Additionally, a brief discussion of potential mitigation measures to limit impingement and entrainment impacts will be presented in Chapter 4 of the SEIS.*

Comment: Marine impact can not be assessed at present because definite numbers have not been set on what constitutes "significant impact." A yardstick has to be firmly established for each species (plant and animal) with appropriate federal, state and independent partners and rationales provided to the public.

For example: There appear to be many methods used to determine impact, each with drawbacks. It must be determined before going forward with the re-licensing process what methods provide the most reliable estimates of impact, with a detailed rationale; a requirement that these methods are followed by the licensee unless better methods are established and independently approved.

We understand that no policy statement regarding losses on a square mile basis has been issued by any state or federal agency. NRC must in its review process determine what percent loss is a significant detriment to any population [figure depending on population], with a detailed rationale. (PNPS-AC)

Response: *This comment relates to aquatic ecology and the determination of significant impact. The NRC developed a three-level standard of significance (Small, Moderate, Large) for assessing environmental issues. These levels of significance were established using the Council of Environmental Quality's regulations (40 CFR 1508.27) to systematically evaluate the consequences of likely environmental impacts of renewing the operating license for a nuclear power plant for an additional 20 years. Significance indicates the importance of likely environmental impacts and is determined by considering two variables: context and intensity. Context is the geographic, biophysical and social context in which the effects will occur, or in the case of license renewal, the environment surrounding the facility. Intensity refers to the severity of the impact.*

Comment: Winter Flounder: DEP's Gerry Szal recommended that resource agencies, in concert with the permitting agencies, should consider further evaluation of the intake effects to winter flounder. If effects are found to be substantial, these agencies should determine what steps need to be taken to reduce the impacts of the facility on the winter flounder population. (PNPS-AC)

Comment: Intake Effects Entrainment: Winter Flounder - methods used by Entergy to determine impact.

1. Equivalent adult method: "researchers conducting this work have assumed an otter trawl efficiency of 50%, but the actual efficiency may be much lower (or higher), which would alter the number of fish in the study area per square mile and the apparent impact. Second, entrainment sampling results are quite variable. Third, it is difficult to determine the accuracy, and therefore, the applicability, of the survival matrix used in estimating equivalent adults."

Whether or not these levels of impact are a "significant" detriment to the population, and will result in slowing the return to much higher population densities, is currently unknown and a policy statement regarding losses on a square mile basis has not been issued by any of the state or federal agencies. EPA Region 1 has stated in the past that population impacts of 5% or greater are typically of concern. However, to DEP's Gerry Szal's knowledge, the geographic bounds of this particular population have not been agreed upon by state or federal agencies.

2. 2nd method - estimate the percentage of the total larval population passing in front of the facility that is entrained.

3. The third method used by the facility to evaluate impact was the RAMAS (Risk Analysis Management Alternative System; Ferson, 1993) winter flounder model. It was used from 1999-2001 to further evaluate the effects of the facility on the Cape Cod Bay winter flounder population. Results suggested that stock reductions from 2.3 to 5.2% might occur as the direct result of entrainment at the facility.

It should be determined and agreed upon by NRC, appropriate state agencies and independent analysts what method or methods actually provide accurate information needed to assess impact. (PNPS-AC)

Comment: Rainbow Smelt: "Brad Chase, DMF (pers. comm. to G. Szal, August 29, 2005) estimates that there has been a sharp decline in the rainbow smelt population in the Jones River since the time when the Lawton, et al. (1990), studies were conducted. Unfortunately, without a quantitative evaluation of the rainbow smelt population size in the Jones River, Mr. Chase felt it was not possible to assess the potential impact of Pilgrim's impingement events on the Jones River smelt population." Until studies performed by the state and the Jones River Watershed Association, we should not finalize a re-licensing decision. (PNPS-AC)

Comment: In addition, the Town is concerned about the economic impact of an accident, as well as routine operations at the plant, on commercial fisheries in the area. The local population of winter flounder, in particular, is of significant concern because it provides an important commercial fishery and because the area around the plant serves as spawning,

nursery, and feeding grounds for the species. A moderate or severe accident at the plant would have a deleterious effect on the flounder population, and therefore commercial fishery in the region. While the ER concludes that plant operations "have not had a significant effect on local and regional populations of fish and shellfish," (ER, Chapter 2.2.5) the Town submits that additional evaluation of the intake effects to winter flounder are warranted to assess accurately the long-term implications on this species of continued operations at Pilgrim during the renewal period. (PNPS-AE)

Comment: In the past, Entergy has used the following three methods to evaluate the Station's entrainment impacts to the local winter flounder population: (1) the "equivalent adult" method; (2) estimating the percentage of the total larval population passing by the facility that is entrained; and (3) the RAMAS (Risk Analysis Management Alternative System: winter flounder model. We believe these three methods, and others as appropriate, should be discussed in the EIS based on coordination with the EPA and other interested state and federal agencies. In coordination with EPA and other interested resource agencies, the EIS should include an analysis of the accuracy and applicability of these methods. (PNPS-AG)

Comment: What we have learned, over time, and I was trained as a psychologist, I was not trained as an environmentalist, so we had a lot of learning to do and what we learned, over time, was that the importance of the Jones River, as the largest river in Cape Cod Bay, relates to the larger Gulf of Maine ecosystem, and the Gulf of Maine is one of those very few and rare systems in the world, globally, that provide us with all of our ocean fish. What we are learning is that if the Jones River's fish populations are lost, then the Gulf of Maine health is impacted. (PNPS-G)

Comment: The Jones River, being the largest river in Cape Cod Bay, is important to the ecosystem, not only to itself, but to the bay and to the entire Gulf of Maine. What we have noticed in the Jones River is that the fish are diminishing and while it is true that Pilgrim and Entergy have contributed to our work, that contribution has not overcome what we believe is a growing lessening of the populations of fish, particularly herring and smelt, in the system. Herring and smelt have both a history of entrainment at the plant. (PNPS-G)

Comment: DEP stated that the resource agencies, in concert with the permitting agencies, should consider further evaluation of the intake effects to winter flounder. If effects are found to be substantial, these agencies should determine what steps should be taken next. They particularly pointed out that winter flounder that is dumped in from a Chatham laboratory, that we heard from this afternoon, that these are fish that go in, but they are different, genetically, and they don't breed with the current stock. (PNPS-G)

Comment: Rainbow smelt, as you heard today, they are considering putting on the endangered species list because of their low numbers in the Jones River Watershed. There

should be a policy statement regarding losses on a square mile basis, this has not been done by any federal agency and, if you don't have a real standard, then what are you doing? Also, there appear to be many methods used to determine impact, each with drawbacks. What methods would provide the most reliable results? This should be clearly stated in the analysis provided. (PNPS-N)

Response: *The comments are related to the potential impacts of continued operation of the plant on winter flounder, rainbow smelt, and other aquatic species populations. Assessment of these species, in addition to other aquatic organisms, will be presented in Chapters 2 and 4 of the SEIS.*

A.1.3 Comments Concerning Socioeconomic Impacts

Comment: When the plant came on line in 1972, it was equal in value to all the other assessed property in the Town of Plymouth, so it effectively halved our tax rate. We were the next town, that was South of Boston, that was probably going to experience some strong growth and, coupled by our large land area, 103 square miles, and relatively cheap land prices, and dirt cheap real estate prices, the savings that, at that time, the Boston Edison Plant brought us was soon surpassed by the demands of the burgeoning population on the infrastructure ... We built new elementary schools, new high schools, new middle schools, a lot of roads were developed, some at the expense of developers and often they were maintained at the expense of the town. We're in a position now that we are dependent on the town for a significant portion of our tax, the plant, rather, for a significant portion of our tax revenue. (PNPS-J)

Response: *The comment is related to the socioeconomic impacts specific to PNPS. Socioeconomic impacts such as taxes, employment, and land use are Category 2 issues. These issues will be addressed in Chapters 2 and 4 of the SEIS.*

Comment: Speaking of work, Pilgrim is also an important source of jobs, there is more than 700 permanent, full time employees, most of whom live in Plymouth and the surrounding communities. Indeed, Pilgrim supports the local economy to the tune of $135 million a year in local economic activity. (PNPS-F)

Response: *The comment is noted. Socioeconomic issues specific to the plant are Category 2 issues and will be discussed in Chapter 4 of the SEIS.*

Comment: The Town was founded in 1620 by the Pilgrims escaping religious persecution in England and is known as "America's Hometown." As such, the Town is the cornerstone of American freedom and values. Every year thousands of visitors come to the Town to visit not only Plymouth Rock, but also the other historical sites in and around the Plymouth area. Typically, tourists travel not only to the Town, but also to Boston or out to Cape Cod and other

coastal areas. In 2003, for example, travel expenditures for Plymouth County were $353 million (excluding payroll, state tax and local tax receipts), with the Town receiving a significant portion of those amounts. The contribution of tourism to the health of the local economy, therefore, is central. (PNPS-AE)

Response: *The comment is related to socioeconomic impacts, specifically tourism, recreation, or historic appeal. Public services involving tourism and recreation were evaluated in the GEIS and were determined to be Category 1 issues. Historic and archaeological resources and socioeconomic issues were evaluated in the GEIS and were determined to be Category 2 issues and will be addressed in Chapters 2 and 4 of the SEIS, as appropriate.*

Comment: The total population within a 50-mile radius of PNPS was estimated by Entergy for the year 2032 by combining total resident population projections with transient population data from Massachusetts and Rhode Island...

The region is expected to add 465,000 people by 2030. The region will be aging with a dramatic spike in the over 55 population. The largest population increases are expected in urban centers such as Boston and Cambridge and in a half-dozen suburban towns, such as Plymouth and Weymouth with very large housing developments on the horizon. (MAPC Metro Future projections brief #1)

According to the report the area south of Boston is expected to grow faster in population and jobs than any other section of Greater Boston through the year 2030. Jobs are important because they factor into projecting the transient population.

Communities south of Boston will grow 13%. Plymouth is expected to add the most, about 10,000 residents - a population jump over 20%.

The population is expanding because there is more open land and large projects are planned in Plymouth and on the Weymouth Navel Air Station land ---located just off Route 3, the evacuation route for Duxbury and Marshfield. (PNPS-AC)

Response: *Socioeconomic issues, including demographics, that are considered to be Category 2 issues, will be addressed as appropriate in Chapters 2 and 4 of the SEIS.*

A.1.4 Comments Concerning Human Health

Comment: We hope you will also be looking at the new information, since `72, of health impacts in our communities. There has been a case controlled study of adult leukemia, there has been review that has been done of the cancer, of the Massachusetts Cancer Registry, since it started in `82, showing a consistent rise in thyroid and leukemia cancers in the seven

towns that the meteorological `82 study said would be most likely to be impacted. And also, you would consider, in your health analysis, the projected demographic changes, from 2012 forward, of a one in three people in this area over 55 and tie that to the BEIR VII which indicates that older and very young people are more susceptible to damage. (PNPS-A)

Comment: ...there is new and significant information supporting our contention that twenty additional years of "normal" operations will be harmful to public health. Pilgrim releases radiation as part of its standard operations. Radiation-linked diseases are documented in communities around Pilgrim. This fact and projected demographic data indicate that this population will be at an increased risk. The National Academy of Sciences (NAS) latest report on low-dose radiation risk, Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2 (June, 2005) concluded that no amount of radiation is safe. The documented radionuclide releases from Pilgrim in the past have long half-lives and bio-accumulate in the environment. We submit that if the Applicant disputes a causal link between the radiation released by Pilgrim and the cancers seen in its neighboring towns, the current systems in place to monitor releases are inadequate and must be improved. We further submit that if the NRC or State disputes elevated radiation-linked diseases rates or a causal connection that they have not taken into account the unreliability of Pilgrim's monitoring data and reports.

Mitigation ER must consider if Pilgrim is allowed to continue operations:

- Reduction of allowable radioactive emissions into our air and water so that the biological impact is no greater than that allowed from the releases from a chemical plant licensed today and allowable dose reduced to be in synch with current scientific knowledge on the effects of low-dose radiation on health, National Academy of Sciences' Biological Effects of Ionizing Radiation, BEIR VII report.

- Verification of releases by combination radiation and weather monitors – computer linked to state and local authorities – at all points where radiation is released from Pilgrim and at appropriate off-site locations in the seven most impacted towns and on Cape Cod. (PNPS-AC)

Comment: The National Academies Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, the National Research Council, published Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2 in 2005. Drawing upon new data in both epidemiologic and experimental research, they concluded that no amount of radiation is safe. There is a linear no threshold response to radiation, and exposure to low levels of radiation is approximately three-times more dangerous than previously thought. BEIR VII: Health Risks from Exposure to Low Levels of Ionizing Radiation, Report in Brief, June 2005. Therefore it is not surprising that radiation-linked disease rates are higher than expected in communities exposed to Pilgrim's past releases.

A summary of cancer deaths estimated at NRC's permissible dose release is provided in the BEIR VII Report. The report shows the number of cancer cases and deaths expected to result in 100,000 persons (with an age distribution similar to that of the entire U.S. population) exposed to 100mSv per year over a 70 year lifetime. On average, assuming a sex and age distribution similar to that of the entire U.S. population, the BEIR VII lifetime risk model predicts approximately one individual in 100 persons would be expected to develop cancer (solid cancer or leukemia) and approximately one in 175 would be expected to die from cancer from a the permissible dose of 100 mSv.

Lower doses would produce proportionately lower risks. For example one in 1000 would develop cancer from an exposure to 10 mSv. This new report validates concerns raised by us and helps explain the radiation-linked disease observed near Pilgrim NPS. When the standards were set by the NRC for permissible release of off-site radiation, low levels of radiation were considered harmless. However, the BEIR VII report now reveals that any exposure is potentially dangerous. Therefore it is not surprising that radiation-linked disease rates are higher than expected in communities exposed to Pilgrim's past radiological releases.

This new information is particularly relevant to the issue of re-licensing Pilgrim because twenty additional years of exposure will harm an already damaged population. Both BEIR VII and previous nuclear worker studies show that the health effects of radiation are cumulative. Effects of Radiation and Chemical Exposures on Cancer Mortality Among Rocketdyne Workers: A Review of Three Cohort Studies. Morgenstern, H and Ritz, B., Journal: Occupational Medicine: State of the Art Reviews, Vol. 16, No. 2, April-June 2001, pages 219-238. And as shown previously, there is a growing and aging population in the area immediately surrounding the plant. This population has already been harmed by the effects of radiation from Pilgrim and as a result is more susceptible to even permissible levels of off-site radiation. An additional twenty years of operations would put a group that is already damaged at further risk. (PNPS-AC)

Comment: In its Final Environmental Impact Statement, the 1972 owners of Pilgrim stated in the Summary of Environmental Impacts and Effects, Chapter 5-c. that, "The effluents from the facility, if operated as described by the Applicant and in accordance with the technical specifications and rules and regulations of the Commission, will not endanger the public health or the natural environs of the station." Final Environmental Impact Statement, Pilgrim Nuclear Power Station, Boston Edison Company, Docket 50-293, 5-c, p. iii, US Atomic Energy Commission Division of Radiological and Environmental Protection, (May 1972). In its current Application, Appendix E, Applicant states "Very low levels of radioactivity may be released in plant effluents if they meet the limits specified in NRC's regulations. These releases are closely monitored and evaluated for compliance with the NRC restrictions in accordance with the PNPS Offsite Dose Calculation Manual." ER Appendix E.3.2.3.1. Essentially the same was stated regarding solid and gaseous releases. Therefore the assumption is that there will be no danger

to public health from routine releases since they will be monitored and will not exceed federal limits. However, despite this confidence written into the Application, we bring forward new and significant information that demonstrates that there has already been documented radiation linked disease in the communities near PNPS. In addition, a recent report was published by the National Academy of Sciences that demonstrates that there is no safe dose of radiation for humans. (PNPS-AC)

Comment: Epidemiological studies of cancer rates in the communities around Pilgrim show an increase of radiation-linked disease that can be attributed to past operations of the plant. The demographics of the population immediately surrounding the plant, including its age and geographical distribution, make this population more susceptible to more radiation-linked damage than was contemplated when the plant was licensed.

If Pilgrim is allowed to continue operations this should only be allowed under the following conditions so that public health would be better protected.

- Reduction of allowable radioactive emissions into our air and water so that the biological impact is no greater than that allowed from the releases from a chemical plant licensed today and limits that are in synch with BEIR VII.

- Verification of releases by radiation and weather monitors computer linked to state and local authorities at all points where radiation is released from Pilgrim and at appropriate off-site locations - appropriate sites chosen by meteorological analyses. (PNPS-AC)

Comment: Health Impact: Projected age distributions will affect the expected health impact to the population from radiation exposure – both routine and above routine. This must be analyzed – the licensee's filing failed to do so.

By 2030, (1) in (3) people will be over the age of 55, compared to 1 in 5 now.

We know from new research that radiation affects the most vulnerable – the young and the old. This makes intuitive sense – for example, the older we get, the more vulnerable we become and this is borne out by research. (PNPS-AC)

Comment: The population directly abutting Pilgrim is increasing substantially and the population is older and thus more susceptible to radiation damage. Changing demographics in communities impacted by Pilgrim are such that the dose effect on the population will be far greater than originally anticipated when the plant was licensed – a larger/denser population and older population.

When Pilgrim was licensed and built in 1972, its location was in an area that was remote and undeveloped. The population around the plant has changed drastically in the last 30 years, and this aging plant is now located in the fastest growing region in Massachusetts. In Pilgrim's backyard, Pine Hills, the largest housing development in New England, is under construction. The build-out includes 2,877 homes on 3,060 acres, and Pine Hills, Inc. is actively trying to acquire more land to build in this area. The distance from Pilgrim to Pine Hills is < 3 ½ miles. The current Pine Hills household size is 1.95 people per building. Based on these numbers, there will soon be 5,850 people living just a few miles from this nuclear plant.

The region is expected to add 465,000 people by 2030 and this group will be aging with a dramatic spike in the over 55 population. The largest population increases are expected in urban centers such as Boston and Cambridge and in a half-dozen suburban towns, such as Plymouth and Weymouth which have very large housing developments on the horizon. The Boston Metropolitan Area Planning Council Report on Population and Employment Projections 2010 -2030, http://www.mapc.org/2006 projections.html. The methodology used by MAPC is described in the report. (see Exhibit F-1). According to the report the area south of Boston is expected to grow faster in population and jobs than any other section of Greater Boston through the year 2030. Communities south of Boston will grow 13% and Plymouth is expected to add the most, about 10,000 residents a population jump of over 20%. By 2030, 1 in 3 people will be over the age of 55, compared to 1 in 5 now. This is relevant to any analysis of health impacts, as studies have shown an increased sensitivity to low levels of ionizing radiation in older populations. Greater Sensitivity to Ionizing Radiation At Older Age: follow-up of workers at Oak Ridge National Laboratory through 1990. Richardson, D.B. and Wing, S. Int. J. Epidemiol., 1999, 28:428-436; The Hanford Data: Issues of Age at Exposure and Dose. Stewart, A.M., Kneale, G.W., PSR Quarterly Vol. 3, No. 3 (Sept. 1993) 3:101-111; and Leukaemia near nuclear power plant in Massachusetts, Richard Clapp, Sidney Cobb, C. K. Chan, Bailus Walker, 924 , Lancet, 1987. (PNPS-AC)

Comment: There is new information since Pilgrim began operations in 1972 that shows increases in radiation-linked diseases in the communities around Pilgrim. The increases were in part attributed to operating with defective fuel; operating without the off-gas treatment system in the first years; poor management and practices culminating in the releases in June 1982 that coincided with weather conditions that held the releases over the area. Southeastern Massachusetts Health Study 1978-1986, Morris, Martha and Knorr, Robert, Commonwealth of Massachusetts Executive office of Human Services, Department of Public Health, 1990 and Meteorological Analysis of Radiation Releases For the Coastal Areas of The State of Massachusetts For June 3rd to June 20th, 1982, William T. Land. (PNPS-AC)

Comment: The cancers found in the communities around the power station initially were studied by Dr. Sidney Cobb and Dr. Richard Clapp and their results were published in a peer reviewed journal in 1987. They included elevated rates of Myelogenous Leukemia – a type of

cancer most likely to be triggered by exposure to radiation. This led to a case control study carried out by the Massachusetts Department of Public Health that showed a four fold increase in adult Leukemia between 1978 and 1983. The report stated "a dose-response relationship was observed in that the relative risk of leukemia increased as the potential for exposure to plant emissions also increased." (PNPS-AC)

Comment: The Southeastern Massachusetts Health Study was conducted, peer reviewed, and made public during the Dukakis Administration. However, there was a complete about face in November 1990 when Governor Weld took office that has continued through successive Massachusetts Republican Administrations. December 1990, Governor Weld sent his Executive Secretary to accompany Pilgrim's Vice President, Ralph Bird, and Pilgrim's Health Physicist, Tom Sowden, to visit Massachusetts' Interim Commissioner of Public Health, David Mulligan. At that meeting Pilgrim presented their "wish list" and obviously they had the Governor's blessing. Pilgrim, the implicated industry, would be allowed to appoint a second peer review panel to re-review the Southeastern Massachusetts Health Study; and, until the industry's peer review panel decided whether the study was credible all the study's recommendations would be put on hold. The second peer review panel could find nothing wrong with the study's methodology. The re-review panel stated clearly in their report, Review of the Southeastern Massachusetts Health Study by Hoffman, Lyon, Masse, Pastides, Sandler, Trichopoulos, submitted to the Commissioner of Public Health, October 1992 in the Executive Summary that, "The [original SMHS] study team adhered to generally accepted epidemiologic principles…" and "the findings of the SMHS cannot be readily dismissed on the basis of methodology errors or proven biases…" But somehow they just couldn't believe it - given Pilgrim's emissions. However for emissions data, the re-review committee relied on data collected and provided by Pilgrim - not surprisingly it indicated that Pilgrim hardly emitted any radiation – and one offsite monitor located in South Boston, well outside the EPZ and outside the geographic area likely to pick up routine emissions.

The story gets worse. Massachusetts Department of Public Health allowed Pilgrim, the implicated industry, to provide all the sound bites, press releases and public announcements about the re-reviews' findings and refused to let their employees, who conducted the original study, speak to the press. No subsequent studies have been performed. MDPH has chosen to protect the industry's health over the public's health. Once again, we see political science used to re-write real science on behalf of industry. At the May 17, 2006 NRC Public Environmental Scoping Meeting, an NRC official stated that they had visited MDPH and were told by MDPH's Suzanne Condon and the department that there were no negative impacts from PNPS's operations. Our message to you is that MDPH's statements are politically-driven and have little to no resemblance to fact.

Evidence of radiation-linked disease continued. In a statement before the Southeastern Massachusetts Health Study Review Committee [June 26, 1992] Dr. Richard W. Clapp, the

founder and former director of the Massachusetts Cancer Registry and Professor of Environmental Health at Boston University School of Public Health, presented a graphical assessment of the pattern of leukemia and thyroid cancer in the towns closest to Pilgrim during the period 1982-1989. Analysis of 1974-1989 Massachusetts Cancer Registry for Leukemia & Thyroid Cancer, Dr. Richard Clapp, DSc, MPH (2006), personal communication.

The incidence of leukemia peaked in 1982 and subsequently declined until 1986. Then there was a second, smaller peak in 1987 and 1988 while declined in 1989. The number of cases exceeded the number expected in 1982-85 and 1987-88. The second graph depicts the pattern of thyroid cancer in the same set of towns. It shows a peak in the years 1987-1988. These patterns of cancer incidence are consistent with the predicted health effects of the radiation released in the early 1980s.

The graph shows the predicted health effects. A statistically significant increase in childhood leukemia was noted in communities near Pilgrim, too. Although Massachusetts Department of Public Health recommended a state sponsored case controlled childhood leukemia study, it was not done.

The Massachusetts Cancer Registry also shows, for the years 1998-2002, a continuing increase of leukemia and thyroid cancer in the towns around PNPS. Specifically, there were 83 cases of leukemia reported to the Massachusetts Cancer Registry (MCR), where 72.9 would have been expected based on statewide rates. This results in a Standardized Incidence Ratio (SIR) of 114 (95% conf. int. = 91-143). In addition, there was excess thyroid cancer in these same towns for the same time period. The thyroid cancer SIR was 122 (95% conf. int. = 96-155). In other words, leukemia was 14% elevated over the statewide rate and thyroid cancer was 22% elevated. Neither of these calculations were statistically significantly elevated by the usual convention ($P < .05$), but there were more cases than expected nevertheless. This means there is a continuing excess of these two radiation-related cancers in the population, as there was in the 1980s. Analysis of 1998-2002 Massachusetts Cancer Registry for Leukemia & Thyroid Cancer, Dr. Richard Clapp, 2006, personal communication.

Prostate cancer and multiple myeloma, both radiation-linked diseases, are also elevated and statistically significant for the years 1998-2002 in the seven towns most likely to be impacted near Pilgrim (Carver, Duxbury, Kingston, Marshfield, Pembroke, Plymouth, and Plympton). Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2 (2006). Occupational Radiation Studies, Chapter 8, National Academies Press, 2006. Specifically, data from the Massachusetts Cancer Registry indicates 613 cases of prostate cancer vs. 513.5 expected, SIR=119 (95% C.I.=110-129); multiple myeloma: 47 cases vs. 31.7 expected, SIR=148 (95% C.I.=108-198). Analysis of 1998-2002 Massachusetts Cancer Registry for Leukemia & Thyroid Cancer, Dr. Richard Clapp, 2006, personal communication. (PNPS-AC)

Comment: The population of the Town is approximately 14,000 families, with tens of thousands of children who would be highly vulnerable to a radioactive leak or other event which could expose them to radioactive material above federally acceptable levels. In addition, there is a sizable retirement community, many members of which also would be vulnerable to overexposure to radioactive material. (PNPS-AE)

Comment: Given that the population in and around the Town has increased dramatically in the last 30 years, the radiological dose effect on the population will be far more significant than originally anticipated. When the plant was built in the 1970s, Plymouth was a quiet rural community with a small population that grew seasonally with tourism. Today, Plymouth's year-round population has more than tripled and it has become a year-round "city." Pilgrim now is located in the fastest growing region of Massachusetts, which raises considerable implications for postulated radiological dose effects. (PNPS-AE)

Comment: We have heard various studies have been performed and I would like to make sure that the scope does take into account an examination of various studies of cancer. I know I have anecdotally seen, in Duxbury, people with breast cancer, with various types of cancers, that I'm not sure, and I don't know the answer, and I'm not accusing anyone of anything, but I would like to make sure that if there is any evidence that does link health effects from radiation to these various cancers, that be studied and, if there is obviously a causal effect, that, to me, would be grounds for not relicensing the plant. (PNPS-L)

Comment: We urge the NRC to consider, in depth, all the significant environmental impacts which we believe are grounds for denying the relicense of the plant. The National Academy of Sciences BEIR VII report, biological effects of ionizing radiation, June, 2005, stated that there is no safe dose of radiation. Pilgrim emits radiation daily and these radiation releases have been linked to increased rates of leukemia and thyroid cancers in the towns around Pilgrim. (PNPS-M)

Comment: Another piece of new information is the BEIR VII report which found exposure to low level radiation at least three times more damaging than heretofore thought. Also, we have, as new information, the demographic changes projected from 2012 to 2032 of a one out of three being over 55 and older people are susceptible to radiation damage than younger. Also, the BEIR VII report pointed out the synergistic effect of radiation with other toxins, each magnifying the other's mischief, if you will, and no one can doubt the fact that, between 2012 and 2032, there will be more, not less, pollution. (PNPS-N)

Comment: Health is another issue that should be considered on a site specific basis, again because of new and significant information. There have been studies of health damage in this community, there were studies done by Dr. Sidney Cobb and Dr. Richard Clapp in the `70s, there was a case controlled leukemia study showing a fourfold increase the closer you lived or

worked to Pilgrim. Then there has been a statistical or simply significant increase in thyroid cancer and leukemia in all seven impacted communities because both Pembroke and Plympton are effected by the sea breeze effect and get these emissions. (PNPS-N)

Comment: We do need to find out whether there is any statistically significant amount of radiation in the communities surrounding this plant and we need to find out whether there is any relationship between that and incidents of cancer that are statistically significant in being higher than should normally be expected. I have a certain kind of cancer and so do the four people that live next to me on my street, we need to find out why. I'm not casting dispersions on the plant or suggesting that it's cause, that it's the cause of this, but we do need to find out what the cause is. (PNPS-P)

Comment: I heard a lot about thyroid cancer, ...and I would be interested to see if, on those studies, they also did genetic studies ...I wonder how much of it is genetic and how much of it is environmental too, so I would like to see, on those studies, if they also followed that up with genetics too. (PNPS-X)

Comment: I'm interested in what kind of epidemiological studies have been conducted on cancer rates related specifically to Pilgrim, as well as other areas with nuclear plants, and I'm hoping somebody can help distribute that information. (PNPS-Y)

Response: *The comments are related to human health issues. Human health issues were evaluated in the GEIS and were determined to be Category 1 issues. The GEIS evaluated radiation exposures to the public for all plants including PNPS, and concluded that the impact was small. During the plant-specific environmental review of PNPS, the NRC will determine whether there is any new and significant information bearing on the previous analysis in the GEIS. The information provided by the comments will be reviewed as part of that search. Human health effects from radiation exposure due to operation of the plant during the renewal period will be addressed in Chapter 2 and 4 of the SEIS. In addition, evaluation of new studies and analyses of the health effects of radiation exposure is an ongoing effort at the NRC.*

In spring 2006, the National Research Council of the National Academies published, "Health Risks from Exposure to Low Levels of Ionizing Radiation, BEIR VII Phase 2." A prepublication version of the report was made public in June 2005. The major conclusion of the report is that current scientific evidence is consistent with the hypothesis that there is a linear, no threshold dose response relationship between exposure to ionizing radiation and the development of cancer in humans. This conclusion is consistent with the system of radiological protection that the NRC uses to develop its regulations. Therefore, the NRC's regulations continue to be adequately protective of public health and safety and the environment. None of the findings in the BEIR VII report warrant changes to the NRC regulations. The BEIR VII report does not say there is no safe level of exposure to radiation; it does not address "safe versus not safe." It

does continue to support the conclusion that there is some amount of cancer risk associated with any amount of radiation exposure and that the risk increases with exposure and exposure rate. It does conclude that the risk of cancer induction at the dose levels in the NRC's and EPA's radiation standards is very small. Similar conclusions have been made in all of the associated BEIR reports since 1972 (BEIR I, III, and V); the BEIR VII report does not constitute new and significant information.

A.1.5 Comments Concerning Uranium Fuel Cycle and Waste Management

Comment: The other item, of course, is waste, that supposedly it's off the table but I think, quite clearly, you cannot have a severe accident mitigation analysis without including what could happen by accident, and accidents can happen, to the spent fuel pool. That seems like a logical place to pull the issue of spent waste, high level waste, into the SAMA, and I hope also that you would consider and analyze buried waste that was allowed to be buried on site until 1981. I assume that when it was allowed to be buried, there was an assumption and analyses of the time that it would remain stable, until the license ended in 2012 and decommissioning would begin. What will another 20 years do to it? Will it remain stable for another 20 years? Do you even know what is buried there, what the packaging is, etcetera? There should be a complete inventory of what's there, curies, volume, packaging, a map where it is and whether the six feet of soil is still over it, and whether you would recommend, for mitigation, monitoring wells so we can see whether it is going into the bay, which is the only other place it can go because of the topography. (PNPS-A)

Comment: According to Entergy, the facility will run out of space in its spent fuel pool by 2012 and there are no prospects for off-site storage in the foreseeable future. The ER states simply and cryptically with respect to spent fuel storage during the 20-year renewal period: "[t]he spent fuel assemblies are then stored for a period of time in the spent fuel pool in the reactor building and may later be transferred to dry storage, if needed, at an onsite interim spent fuel storage installation provided necessary regulatory approvals are obtained. Thus, a significant amount of "hot" spent fuel will remain in the spent fuel pool at Pilgrim, which represents a long-term risk to the Town that is not adequately addressed in the license renewal application. (PNPS-AE)

Comment: On-site storage of spent fuel assembles which, already densely [packed in the cooling pool, will be increased by fifty percent during the renewal period. The spent fuel will remain on-site longer than was anticipated and is more vulnerable than previously known to accidental fires and malicious attacks. The Pilgrim plant operator recently has stated that "[the plant] will run out of space in 2012. This was never intended to be a repository for any length of time." Accordingly, the ER should address the likely impacts of on-site storage in the years to come. (PNPS-AE)

Comment: Even if present plans for establishing a federal waste repository at Yucca Mountain move forward on schedule, that facility would reach maximum capacity long before a relicensed Pilgrim stops generating its waste. Plant owners and the NRC need to have a clear and safe plan for storage of radioactive waste before the extension is granted. (PNPS-M)

Comment: Over 1.2 million pounds of high level radioactive nuclear waste is stored on site at the Pilgrim Plant, this waste poses a risk to the health of humans and ecosystems for centuries to come, but there are currently no clear disposal options outside of the state. (PNPS-M)

Comment: ...on spent fuel, that this should be considered in this relicensing process because there is significant new information which is the standard, the new information that is significant is that excluding spent fuel from the review was based on a feeling there would be off site options. However, we know there are no off site options in any period of time that we will be talking about in the license extension. (PNPS-N)

Comment: The Waste Confidence Act, which exists and was the underpinning of why spent fuel is not looked at, does not hold water, so the new information is Yucca is not going to happen any time soon, reprocessing is not going to happen any time soon, nor is the Gashuti Indian Tribe place going to happen any time soon, so we'll be here. Therefore, we must be told beforehand what the options will be for safer storage. The Town of Duxbury, on two occasions, has stated that we want safer interim storage, meaning low density pool storage, and secured, hardened dry cast storage until there is an off site option. (PNPS-N)

Comment: The radioactive waste problem was another issue which the nuclear energy industry would have to solve in the future. When the plant was originally commissioned, we were promised that this was a problem that would be resolved. This problem has not been solved, the radioactive waste produced by Pilgrim sits on the site of the plant and will continue to increase in quantity for another 20 years if the plant is relicensed. Maybe it could be shipped to Yucca Mountain in Nevada where it would have to remain safely contained for over a million years. Take a trip to Las Vegas and ask the officials there if they have faith in the nuclear industry. (PNPS-Z)

Response: *On-site storage of spent nuclear fuel is a Category 1 issue. The safety and environmental effects of long-term storage of spent fuel on-site have been evaluated by the NRC and, as set forth in the Waste Confidence Rule (10 CFR 51.23), the NRC generically determined that such storage could be accomplished without significant environmental impact. In the Waste Confidence Rule, the Commission determined that spent fuel can be stored on-site for at least 30 years beyond the plants life, including license renewal. At or before the end of that period, the fuel would be moved to a permanent repository. The GEIS, NUREG-1437 is based upon the assumption that storage of the spent fuel on-site is not permanent. The plant-*

specific supplement to the GEIS that will be prepared regarding license renewal for PNPS will be based on the same assumption.

Comment: In 2008, North Carolina has stated they will not be taking waste from Massachusetts. We are not a member of any compact state. There was a determination that we were not going to be a low level radioactive waste site, so what would the future be, having both high level waste and low level waste, which isn't necessarily low in toxicity or longevity, on-site? What should we be doing for that? (PNPS-A)

Comment: Waste containers and forms will not last as long as some waste remains hazardous. Therefore, we want to know what Entergy's plans are for storing LLRW; monitoring the releases; and what are the "acceptable" public radiation exposures and health risks. (PNPS-AC)

Comment: LLRW should be looked at on a site specific basis because of new and significant information since Pilgrim's initial license, 1972.

- Pilgrim had offsite options in1972 and reasonably expected them to continue. Not so, now. Barnwell S.C. announced that it will close to Massachusetts generators June 20, 2008.

- Massachusetts is not a member of any compact; in order to join Massachusetts would have to agree to be a host community; Massachusetts indicated clearly in the mid 1990's that it would not be a host community.

- Texas may open, no guarantees, and if it does open there is no assurance that non-Texas Compact members will be able to send their waste there and if allowed whether fees would be prohibitive. The Massachusetts Department of Public Health Radiation Control stated, "As a result of the above, on July 1, 2008 Massachusetts generators will have no treatment option other than decay onsite unless Texas opens a new LLRW site for Class B and C wastes. Texas has not decided yet whether non Texas compact members may use their site."

- Terrorism or acts of malice were not considered a threat in 1972. Not so, post 9/11 - nuclear facilities/materials are known to be attractive targets.

- Pilgrim is located on Cape Cod Bay and the property slopes towards the Bay so that any leaking contaminants from waste storage facilities will flow towards and eventually into the Bay. There are no monitoring wells lining the shoreline.

- The undisputed recognition of global warming is new and brings with it increased severity of coastal storms, erosion, and increased sea levels. Hence this must be factored into on-site waste storage options.

- PNPS is located on the coast -- a salt corrosive environment on concrete and waste packaging must be analyzed.

Storage of LLRW is important for our community's health and safety because there is nothing low level about the waste. Waste is characterized "high" or "low" depending on where it comes from, how it is generated, not according to its' toxicity and longevity. Our community's health has been compromised by radiation exposure – discussed above.

We deserve to know what the LLRW storage plans are before the application is decided; so that the re-licensing decision does not prejudge any LLRW storage decision. (PNPS-AC)

Comment: The Licensee's filing discusses Low Level Radioactive Waste in Appendix E, Applicant's Environmental Report Operating Renewal Stage Pilgrim Nuclear Power Station, Chapter, 3.23. The discussion covers a brief overview of what they do with waste now. The application makes one mention of low level radioactive waste which does not bear on the subject- Applicant's Environmental Report 6.4.2 "land required to dispose of spent nuclear fuel and low-level radioactive wastes generated as a result of plant operations." What is not discussed, but needs to be analyzed, is what Entergy plans to do with LLRW from 2012-2032. (PNPS-AC)

Comment: The environmental impacts of so-called "low level" radioactive waste storage, 2012-2032, should be analyzed in a site specific SEIS. Because: there is no guarantee that offsite options will exist after June, 2008; Pilgrim's coastal location is not suitable for waste storage - a salt corrosive environment; increased intensity and frequency of storms predicted for the future; topography is such that contaminants that have leaked will migrate/flow towards and perhaps into Cape Cod Bay; the threat of terrorism. All of these factors could work together to increase the probability that stored nuclear wastes could contaminate the environment and endanger public health and safety. (PNPS-AC)

Response: *The comments are related to the environmental impacts associated with the uranium fuel cycle and Low Level Radioactive Waste Management (LLRW), which were evaluated in the GEIS and determined to be Category 1 issues. The GEIS evaluated impacts associated with the uranium fuel cycle and LLRW management for all plants including PNPS, and determined that the impact was small. During the plant-specific environmental review of PNPS, the NRC will determine whether or not there is any new and significant information bearing on the previous analysis in the GEIS.*

Comment: The Aging Management Program does not include an analysis of the potential contamination from buried waste onsite. We understand that until 1981 so-called low-level radioactive waste was allowed to be buried at reactor sites. We asked the NRC if Pilgrim buried waste on-site up until that date and were informed by Cliff Anderson that they did not. However, there have been persistent rumors that waste indeed had been buried onsite and we request that this be investigated.

Cliff Anderson, Branch Chief, USNRC, Region I, May 31, 2006 sent to us the following email. The licensee for the Pilgrim station did not conduct any burials of radioactive material prior to 1981 in accordance with the former NRC regulation 10 CFR 20.304, which governed such burials at that time. Notwithstanding, the Pilgrim station did conduct an "alternate disposal" under 10 CFR 20.302 (now cited as 10 CFR 20.2002). That disposal option was requested per 10 CFR 20.302 in a letter, dated January 15, 1993, from Boston Edison Company, and consisted of on-site disposal (i.e., burial) of soil that contained residual contamination from several events. (The events are described in licensee event reports (LERs) 77-29, 82-19 and 88-26.) The licensed material covered by the request included 79,000 cubic feet of excavated construction soil that contained a total radionuclide inventory of 0.636 millicuries of cobalt-60 and Cesium-137. The NRC staff approved the request by letter dated May 4, 1993, with the provision that the NRC Safety Evaluation (SE), enclosed with the May 4, 1993 letter, be permanently incorporated in the Offsite Dose Calculation Manual.

The NRC SE concluded the maximum dose from the disposal area would be less than 0.1 millirem/year during the year of disposal; and that doses during subsequent years through the time of site decommissioning would be less than 0.01 mrem/year. The total dose was well within the staff's guideline of 1 millirem per year, and is a small fraction of the 300 millirem received annually by a member of the public from natural background sources of radioactivity.

The location of the LLRW and the burial method are described in the NRC SE enclosed with the May 4, 1993 letter. The NRC found the disposal location acceptable because of its distance from wetlands and Cape Cod Bay, and because any surface runoff would be entirely within the Pilgrim owner controlled area. We are forwarding the NRC SE to you by regular mail (USPS). The results of NRC inspection of this area were described in NRC Integrated Inspection Report 1999-01, which also will be forwarded by USPS mail.

The onsite spill and burial information is maintained in the licensee's 10 CFR50.75(g) file in accordance with regulatory requirements. Such residual contamination is acceptable per the rule and, as noted above, the public dose consequences are negligible in comparison with the dose from natural background radiation.

Pilgrim Watch has not received the NRC SE or the NRC Integrated Inspection Report 1999-01. These documents should be reviewed by the ER and made public. Regarding the material

buried referred to by Cliff Anderson we assume that when permission was granted to bury the waste that it was assumed that decommissioning would occur in 2012 and the contamination would be cleaned up; so-called "low-level" waste was indeed low level in its health impact; and the Radiological Environmental Monitoring Program would detect offsite contamination at levels of concern. However these assumptions are no longer tenable if the application is approved.

Cliff Anderson ignored the burial onsite of contaminated materials from the 1987-1990 repairs for which we believe there is no official record; these burials are well known. Those burials must be responsibly dealt with - monitored and remediated, not continue to be ignored for an additional 30 years.

Decommissioning, if the application is approved, will not begin until 2032 or later. We assume that the licensee and NRC determined that burying waste onsite would not harm the environment based on a definite time frame – a 40 year license. What would happen after 60 years was not considered nor analyzed. It needs to be to provide reasonable assurance that public health and safety will not be negatively impacted. For example erosion of the top soil will be affected by the passage of time, increasing frequency and severity of coastal storms; and the topography of the site that slants down into Cape Cod Bay. Migration of contaminants underground is currently not monitored. Migration of contaminants from so-called low level waste has happened at other sites - for example, at Barnwell SC, TVA, Hanford and Starmet. Hence there is no reason to believe that the same could not happen here. (PNPS-AC)

Response: *The comment is related to the environmental impacts associated with Low Level Radioactive Waste Management (LLRW), which were evaluated in the GEIS and determined to be Category 1 issues. As part of the environmental review of PNPS, the NRC will determine whether or not there is any new and significant information bearing on the previous analysis in the GEIS. This determination will include a review and evaluation of this comment submitted during the scoping period.*

A.1.6 Comments Concerning Postulated Accidents

Comment: We know assessments, number one, are low and, more importantly, we know that a piece of property, like a business, the businesses on Court Street, are not only the value of the bricks and the roof but the value of a business. The value of this area involves its tourist appeal, historical value, etcetera, etcetera, and none of those inputs have been put into the model in the SAMA. (PNPS-A)

Comment: For the SAMA, I hope that you will look at mitigation means to diminish the effect on the public. I think somehow, in reading it, and I don't mean to, you know, sound flip, but it seems to be more mitigating the damage to the licensee's pocketbook. That you would look, for example, in the economic damage, that they only seem to consider, they have put, they

have two buckets, farm wells and non-farm, but they don't differentiate for business, for example, and what you see there is a determination of valuation based on assessed value, in a county, divided by the population. (PNPS-A)

Comment: The Town also would lose travel expenditures associated with travelers on their way to Cape Cod, Nantucket, and Martha's Vineyard; travel through Plymouth County is necessary to reach those destinations. Travel to those areas clearly would be restricted in the event of a severe accident at Pilgrim (taking into account that winds often blow toward Cape Cod at the islands), reducing travel expenditures not only in the Town but also in surrounding areas. The loss of economic infrastructure and tourism should be considered in the SAMA analysis to ensure that "realistic" mitigation alternatives are explored, taking such factors into account. (PNPS-AE)

Comment: The economic model used in the SAMA analysis does not take into account the loss of economic activity in the Town as an economic cost of a moderate or severe accident at Pilgrim. The tourism sector is critically important to the economic vitality of the Town and Plymouth County. A multitude of historical sited (e.g., Plymouth Rock, the Mayflower, Plymouth Plantation) are located in close proximity to Pilgrim and attract thousands of visitors to the area. Assuming appropriate clean-up and decontamination of these sites, it is unlikely that tourism would every fully recover after a severe accident, which would be devastating for the Town's economy. (PNPS-AE)

Response: *The comments are related to the impacts of postulated accidents, including design basis and severe accidents. The environmental impacts of design basis accidents is located in Chapter 5 of the GEIS, which contains a detailed discussion of the possible environmental effects of postulated accidents, including socioeconomic impacts. The Commission concluded that consideration of design basis and severe accidents are Category 1 issues. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. The applicant provided a severe accident mitigation alternatives (SAMA) analysis as part of the license renewal application for PNPS. The NRC staff's review of the SAMA analysis will be discussed in Chapter 5 and Appendix G of the plant-specific SEIS for PNPS.*

Comment: Adding a filter to the direct Torus vent system, they come up with that it would cost $3 million and it would only reduce the amount of radiation released by half but, somehow, it's not worthwhile. And so I think that that really speaks to the community and I hope it speaks to you that the emphasis does not seem to be on mitigating effect public health, safety and property, but rather to protect their own wallets. (PNPS-A)

Comment: The Direct Torus Vent System (DTVS) was installed because it was recognized that there was something like a 90% probability of that containment failing. In order to protect

the Mark I containment from a total rupture it was determined necessary to vent any high pressure buildup. The DTVS does not have a filter; therefore unfiltered material will be vented into the neighborhoods. The DTVS provides reason to add additional monitoring to better assess what was released after its use. (PNPS-AC)

Comment: The faulty SAMA analysis used by Entergy in the Environmental Report caused it to wrongly dismiss mitigation alternatives such as adding a filter to the Direct Torus Vent. The purpose of a SAMA review is to ensure that any plant changes that have a potential for significantly improving severe accident safety performance are identified and addressed. Duke Energy Corp., supra at 5. For its SAMA analysis, the Pilgrim Environmental Report explains that, "A cost benefit analysis was performed on each of the remaining SAMA candidates. If the implementation cost of a SAMA candidate was determined to be greater than the potential benefit (i.e. there was a negative net value) the SAMA candidate was considered not to be cost beneficial and was not retained as a potential enhancement. . . "The benefit of implementing a SAMA candidate was estimated in terms of averted consequences." One example of how a poorly performed SAMA analysis can lead to erroneous conclusions is the ER's look at the costs and benefits of installing a Direct Torus Vent filter at Pilgrim.

The Direct Torus Vent System (DTVS) is a method to relieve the high pressure which is generated during a severe accident. In 1986, Harold Denton, then the NRC's top safety official, told an industry trade group that the "Mark I containment, especially being smaller with lower design pressure, in spite of the suppression pool, if you look at the WASH 1400 safety study, you'll find something like a 90% probability of that containment failing." Hazards of Boiling Water Reactors in the United States, Paul Gunter, Nuclear Information Resource Service, Washington, D.C. (March 1996). In order to protect the Mark I containment from a total rupture it was determined necessary to vent a high pressure buildup. As a result, an industry workgroup designed and installed the "Direct Torus Vent System" at all Mark I reactors, including Pilgrim. Operated from the control room, the vent is a reinforced pipe installed in the torus and designed to release radioactive high pressure steam generated in a severe accident by allowing the unfiltered release directly to the atmosphere through the 300 foot vent stack. Use of the vent discharges steam and radioactive material directly to the atmosphere bypassing the standby gas treatment system (SBGTS) filters normally used to process releases via the containment ventilation pathway. There is no radiation monitor on the pipe and valves that comprise the DTV line. William J. Raymond, Senior Resident Inspector, Pilgrim Nuclear Power Station, USNRC, Region I, Branch 5, email correspondence, May 11, 2006.

In response to a question posed by the Town of Plymouth at a public meeting on June 21, 1990 about the decontamination factors for the torus pool of various isotopes, the NRC spokesperson responded that, "Except for the noble gases (consisting of the isotopes of Xenon and Krypton), which are not retained in the pool to any significant degree, the suppression pool is highly effective in scrubbing out and retaining particulate and volatile fission products.

Calculations as well as tests indicate that the suppression pool would be expected to have a realistic decontamination factor (DF) for particulate and volatile fission products of about 100, depending upon the accident sequence and the temperature of the water. This means that about 1% of the particulate and volatile radioactivity entering the pool would be released to the atmosphere, and about 99% would be retained within the pool." Although the NRC spokesman appeared to dismiss this as a trivial release, Dr. Frank von Hippel analyzed the applicant's response and stated that there is an internal contradiction in what we are being told. "The NRC believes that the release from a severe core-melt accident would be reduced [by the suppression pool] by a factor of one hundred. This is considerably more optimistic than estimated in the NRC's first study on the subject. WASH-1400, The Reactor Safety Study, WASH-1400 (1975). Also known as The Rasmussen Report. Also, the contention is that the reduction by a filtration system would have zero benefit. Here the contenders seem to be assuming that a factor of one hundred equals 100%. That is false. Even a release of on the order of 1 percent of the core's radioactive iodine and cesium would be a very severe event." Frank Von Hippel, Program of Science and Global Security, Princeton University, e-mail correspondence, March, 19, 2006.

In its Environmental Report, Entergy analyzes the benefits of installing a filter to the torus vent in the course of reviewing possible severe accident mitigation alternatives. The Pilgrim ER states, "Filtered Vent: This analysis case was used to evaluate the change in plant risk from installing a filtered containment vent to provide fission product scrubbing. A bounding analysis was performed by reducing the successful torus venting accident progression source terms by a factor of 2 to reflect the additional filtered capability. Reducing the releases from the vent path resulted in no benefit. This analysis case was used to model the benefit of phase II SAMAs 2 and 19." (E.2-5). The Report then states, "Basis for Conclusion: Successful torus venting accident progressions source terms are reduced by a factor of 2 to reflect the additional filtered capability. The cost of implementing SAMA at Peach Bottom was estimated to be $3 million. Therefore this SAMA is not cost effective for [Pilgrim]." (E.2-24). (emphasis added) In other words, as they show in Table E.2-1, Entergy has determined that in return for a cost of $3,000,000.00, there will be no (0.00%) benefit to public health and safety.

It is not clear to Petitioners how it is possible to find zero (0.00%) benefit from installing a filter that would reduce by a factor of two the radioactive venting to the public in the case of a severe accident. Unfiltered venting has been judged unsafe by all regulatory agencies outside the United States. David C. Dixon, Pilgrim Direct Torus Vent System, Presentation to Massachusetts Joint Committee on Energy (February 27, 1990). In its analysis of several risk contributors to Core Damage Frequency in Chapter E.1, the disposition of those events in Table E.1-3 frequently included "venting via DTV path to reduce containment pressure." In other words, a filter in the torus vent could reduce the impact in many possible severe accidents. The only conclusion to draw from the outcome of the DTV filter SAMA analysis is that, as discussed above, Entergy has used the MACCS2 code to downplay the health and economic costs of

severe accidents and used the Probabilistic Safety Analysis (PSA) model to make the benefits of mitigation appear to be zero.

We respectfully request the ER to include a review of Entergy's analysis. In addition we request the studies that NRC is currently depending to support NRC's assertion that the release from a severe core melt accident would be reduced by a factor of one hundred. This is considerably more optimistic than estimated in NRC's first study on the subject (WASH-1400, 1975). Last, if the NRC agrees with Entergy's analysis that a filter's benefit is not worth the cost to present to the public both NRC's and Entergy's complete calculations and supporting studies. (PNPS-AC)

Comment: My comments tonight are on the direct Torus vent system that Pilgrim, as a Mark One boiling water reactor, was built with a faulty containment system and, in order to protect that containment from total rupture, it was determined it was necessary to vent any high pressure build up.

So the result was the direct Torus vent system was installed at Pilgrim, as well as all Mark One reactors, this system is an extension of the containment ventilation system installed as a plant upgrade in the 1980s, but it bypasses the standby gas treatment system filters normally used to process releases via the containment ventilation pathway. Operated from the control room, the vent is a reinforced pipe installed in the Torus and designed to release radioactive, high pressure steam generated in a severe accident by allowing the unfiltered release directly to the atmosphere through a 300 foot vent stack. There is no radiation monitor on the pipe and valves that compromise the direct Torus vent line. So venting can result in a significant radioactive release, even a release on the order of one percent of the core's radioactive iodine and cesium would be a very severe event. Reactor operators now have the option, by direct action, to expose the public and the environment to unknown amounts of harmful radiation in order to save containment. The purpose of the containment is to provide a barrier between the lethal radiation inside the reactor and the public.

As a result of the GE design deficiency, the original idea for a passive containment system has been dangerously compromised and given over to human control with all its associated risks of error and technical failure. We want indirect venting, that is allowing the steamer air to escape only after it's passed through filters. The wet well pool will not scrub out or eliminate highly radioactive fission products. Unfiltered venting has been judged unsafe by all regulatory agencies outside the United States, the only advantage of direct venting is saving money for the industry at the expense of the population. (PNPS-Q)

Comment: The EPA has an acceptable standard for exposure but, in the real world, there is no safe level of exposure to radiation. Under the severe accident mitigation analysis, Pilgrim's application stated that a filter would reduce by half the amount of radiation that would be

released in an accident. I think half is a major benefit for public health and safety. The consequences should be calculated and compared with the cost of the filtration system and mitigation should be focused on the protection of public health, safety and the regional economy, not a cost benefit for a multi billion dollar industry trying to save dollars. (PNPS-Q)

Comment: The Pilgrim site is located on the western shore of Cape Cod Bay in the Town of Plymouth, Plymouth County, Massachusetts (the "Town"). As such, the Town is in direct proximity to any nuclear incidents that may occur. With a current estimated population of approximately 59,000, an incident at Pilgrim that emits radioactive material could have devastating impacts on the health of the Town residents. In addition, the Town economy is heavily reliant on tourism. Any nuclear incident would deal a severe blow to tourism and the related economy for the years to come and have a potentially ruinous effect on the local economy. Thus, the Town urges the Commission to fully review all aspects of the Pilgrim plant to assure that the citizens of Plymouth and surrounding areas are fully protected from negative or dangerous environmental impacts associated with the plant's relicensing. (PNPS-AE)

Response: *The comments are related to the impacts of design basis accidents and severe accidents. The impacts of design basis accidents and severe accidents were evaluated in the GEIS and determined to be small for all plants; therefore, they are Category 1 issues. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. During the plant-specific environmental review of PNPS, the NRC will determine whether there is any new and significant information bearing on the previous analysis in the GEIS. Chapter 5.1.2 of the plant-specific SEIS for PNPS will address severe accidents. The applicant provided a severe accident mitigation alternatives (SAMA) analysis as part of the license renewal application for PNPS. The NRC staff's review of the SAMA analysis will be discussed in Chapter 5 and Appendix G of the plant-specific SEIS for PNPS.*

Comment: The Environmental Report included in Entergy's license renewal application sets forth a flawed SAMA analysis that misstates the consequences of a severe accident at Pilgrim. Specifically, the SAMA analysis uses inaccurate input data that underestimated the economic consequences of severe accidents at the plant. (PNPS-AE)

Response: *The comment is related to the severe accident mitigation alternatives analysis. This analysis will be discussed in Chapter 5 and Appendix G of the SEIS.*

Comment: ...the National Academy of Sciences' study on the vulnerability of spent fuel storage and they stated, unequivocally, that reactors designed like Pilgrim, Mark One BWRs, that have the pool high up in the attic, if you will, of the reactor building, are the most vulnerable to loss of water, whether by accident or attack, and there would be a consequence, fire, in a dense pool

that could not be put out and could contaminate 500 miles. Therefore, for at least these two pieces of new and significant information, it should be considered. (PNPS-AC)

Comment: The SAMA analysis fails to address the environmental impacts of the on-site storage of spent fuel assemblies which will be significantly increased during the renewal period; it does not contemplate a severe accident in the spent fuel pool, but should. (PNPS-AE)

Comment: The ER should address the risk of an accidental spent fuel fire at the plant. The risk of fire is increased because the spent fuel is densely packed in "high-density" storage racks. In the event that water in the fuel pool were lost (due to an intentional attack on the plant, for example), cooling of the fuel assemblies would be inhibited and the assemblies could ignite rapidly and spread within the pool, leading to a significant atmospheric release of radioactive isotopes with great threat to public health and the environment. (PNPS-AE)

Comment: The Attorney General seeks consideration in the Supplemental GEIS of the environmental impacts of a severe accident in the Pilgrim fuel pool, including accidents caused by equipment failures, natural disasters, and intentional malicious acts. The Attorney General also seeks consideration of a reasonable array of alternatives for avoiding or mitigating the impacts of a severe pool fire, including combined low-density pool storage and dry storage of spent fuel. (PNPS-AH)

Comment: The Environmental Report is inadequate because it fails to address the environmental impacts of the on-site storage of spent fuel assemblies which, already densely packed in the cooling pool, will be increased by fifty percent during the renewal period. A severe accident in the spent fuel pool should have been considered in Applicant's SAMA review just as accidents involving other aspects of the uranium fuel cycle were. Applicant has included other accidents involving the Uranium Fuel Cycle in its SAMA analysis demonstrating it agrees that these are within the Scope of these proceedings. In addition, new information shows spent fuel will remain on-site longer than was anticipated and is more vulnerable than previously known to accidental fires and acts of malice and insanity. The ER should address Severe Accident Mitigation Alternatives that would substantially reduce the risks and the consequences associated with on-site spent fuel storage.

Mitigation strategies include: requiring low density pool storage and secured (hardened) dry cask storage. These measures are requested by the Massachusetts Attorney General in his petition to intervene and by the Town of Duxbury at Annual Town Meeting, 2005 and 2004. Other strategies were analyzed by Dr. Gordon Thompson and found not to be effective. Reconfiguring the assemblies in the pool will yield a small reduction in risk; however it will do no good if there is partial drainage of water or if debris blocks air flow in a drained pool. The National Academy of Sciences recommended installing a spray cooling system and specified that the system must be capable of operation even when the pool is drained (which would result

in high radiation fields and limit worker access to the pool) and the pool or overlying building, including equipment attached to the roof or walls, are severely damaged." NAS Safety and Security Report, supra at 6 and 57. This is unlikely to be achievable at Pilgrim and once ignition had occurred, spraying water into the pool would feed the fire through the exothermic steam-zirconium reaction. A massive and probably impractical flow of water would be needed to overcome the effect. Doing nothing, as is the present situation, must be weighed against the consequences.

The Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene includes a report on the potential consequences of a spent fuel pool fire at Pilgrim by Jan Beyea, PhD., May 25, 2006...

Beyea stated that, "releases lower than 10% of the Cesium-137 inventory, even releases too low to justify remediation, could have costs associated with loss in property value in the range of 10 to 100 billion dollars (Beyea, page 8)...

Beyea notes that the cancer estimates . . . are lower limits, because they only include cancers from Cesium-137. This approximation ignores shorter isotopes in the fresh fuel in the pool, especially Cesium-134 (Benjamin 2003), page 11. Beyea goes on to say that, "Releases from Pilgrim headed initially out to sea will remain tightly concentrated due to turbulence until winds blow the puffs back over land (Zagar et al.), (Angevine et al., 2006). This can lead to hot spots of radioactivity in unexpected locations (Angevine et al. 2004). Beyea, p.11. Therefore dismissing radiation blowing out to sea is inappropriate. Reduction of turbulence on transport from Pilgrim across the water to Boston should also be studied, according to Beyea's analysis. The program CALPUFF (Scire et al. 2000) has the capability to account for reduced turbulence over ocean water and could be used in sensitivity studies to see how important the phenomenon is at Pilgrim...

It is assumed that an area exists around the "main portion" of plume, where potential property buyers would be concerned about residual risk. (The main portion of the plume is defined as the area where remediation or demolition takes place.) Outside the main plume, contamination would still be measurable. Lack of trust in statements by government would translate into loss in property values. All things being equal, persons would wish to live as far away from contaminated areas as possible.

A spent fuel accident is conservatively estimated to cost from $105 to $488 billion dollars and result in 8,000 – 24,000 latent cancers from exposure to Cesium-137. Exposure to other radionuclides and other resultant diseases, reproductive disorders and birth defects will up the toll.

Currently casks cost about 1 to 2 million dollars per cask. Pilgrim has approximately 440 tons of fuel on-site which would cost about $71 million dollars to place into dry cask storage. In addition, the licensee will incur the costs of moving the fuel out of the pool as it fills anyway, and will ultimately need to put the fuel in dry casks for transfer to a long term repository when one becomes available. The probability of a spent fuel fire increases yearly with the increase in spent fuel densely packed in the pool, and with the risk of ever more sophisticated acts of terrorism increasing. A rough cost/benefit look at moving spent fuel into secured dry cask storage shows that this mitigation makes economic sense. Although in its ER, Entergy has made vague statements about transferring spent fuel assemblies to dry cask storage in the future, it has not outlined how and when this will happen. In a statement to Cape Cod Times, Pilgrim spokesman David Tarantino has stated that Entergy plans to move assemblies out of the spent fuel pools to dry casks only on an as-needed basis, to free up space in the pool for newer spent fuel. This, and the application's silence on the issue of future spent fuel storage, make clear that Entergy has no intention of reconfiguring its pool to low density storage in the future. It also makes it unlikely that the plant will take the initiative to store spent fuel in secured dry cask storage as soon as possible. It is up to the NRC assure that the public's interests are protected and the vote of the Town of Duxbury that re-licensing be opposed unless Safer storage of spent radioactive fuel rods is required until all spent rods are moved offsite - low density pool storage and hardened dispersed dry cask storage.

A plant-specific assessment of the vulnerability of the spent fuel pool to fires caused by accident or acts of malice is mandated by the NEPA requirement to consider all of the environmental impacts of the re-licensing and by the 9th Circuit Court's decision. In addition, NRC Regulations (10 CFR 51.53(c) (ii) (L)) call for consideration of severe accident mitigation alternatives on a plant specific basis if the plant has not already done so. The spent fuel pool, although a Category 1 issue for the purposes of normal operations, should have been included in the Category 2 SAMA analysis of severe accidents in the Applicant's Environmental Report. There is also new information since the Generic Environmental Impact Statement was prepared that demonstrates the spent fuel is likely to remain on-site longer than anticipated, and is more vulnerable to fires than had been known.

Also, it is irrelevant whether the Applicant would have decided on mitigation or not. It is the analysis, or "hard look" that is required by NEPA. "While NEPA does not require agencies to select particular options, it is intended to 'foster both informed decision-making and informed public participation, and thus to ensure the agency does not act upon incomplete information, only to regret its decision after it is too late to correct' (citing Louisiana Energy Services (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 88 (1998))." . . . "if 'further analysis' is called for, that in itself is a valid and meaningful remedy under NEPA." Duke Energy Corp., supra at13. ...

Given the catastrophic impact to human health and the environment if the spent fuel pool experiences loss of water due to accident or terrorist attack, and the benefit that could be achieved at a relatively reasonable cost to the plant operator, mitigation of the existing vulnerability should at least be considered before the license is renewed. (PNPS-AC)

Response: *On-site storage of spent nuclear fuel including spent fuel pool accidents is a Category 1 issue. The NRC staff's review of the SAMA analyses will be discussed in Chapter 5 and Appendix G of the SEIS. These comments provide no new and significant information and, therefore, will not be evaluated further.*

Comment: First item. We know that realistic plume modeling assumptions and wind weather data are key to forecasting and implementing appropriate and effective emergency response plants and to assess damage afterwards. We hope you will look and compare, for this particular site, whether Class A models or Class B models would be the most appropriate way to detect plume dispersion and whether to compare multiple meteorological towers, appropriately located in sites in the community, would give a more accurate picture, in our coastal environment with a varied terrain, than relying simply on the tower on site. (PNPS-A)

Comment: Multidimensional plume dispersion models, Class B Models; and multiple meteorological towers placed in the seven surrounding towns impacted by the sea breeze effect that were identified by Dr. J.D. Spengler [Carver, Duxbury, Kingston, Pembroke, Plymouth, Plympton] and towers located appropriately on Cape Cod in consideration of the site specific meteorological analysis of Cape Cod performed for the Commonwealth by Dr. Bruce Eagan.

Realistic modeling assumptions and meteorological data are the key to forecasting and implementing appropriate and effective emergency response plans and assessing damage afterwards.

Currently, Pilgrim uses Class A plume transport models and relies on weather information from their onsite meteorological tower. Neither provides accurate data.

The Class A plume models used incorrectly assumes a steady-state, straight-line plume transport; although actual wind and weather conditions are variable and complex affected by sea and lake breezes, terrain, location/clustering of buildings, and variable precipitation.

Pilgrim should use complex Class B models now and from 2012-2032 if the license is extended.

The on-site Met Tower only tells us what the wind direction is onsite but not what happens to the plume as it travels offsite. Therefore Pilgrim should use data from multiple weather stations now and from 2012-2032, if the license is extended. (PNPS-AC)

Response: *These comments raise questions regarding the adequacy of various input data and assumptions (i.e. meteorological data) used in the MACCS2 off-site consequence analysis. The MACCS2 analysis will be addressed in Chapter 5 of the SEIS.*

Comment: Pilgrim is located on the coast and the wind is highly variable due to the Sea Breeze Effect, terrain, buildings, and variation in precipitation/fog patches. Therefore planning must be for the entire radius – not simply for those inside one imaginary "relatively narrow plume." (PNPS-AC)

Comment: In light of NRC and EPA's Guidance about the use of refined variable trajectory modeling techniques to provide for more realistic, accurate modeling predictions and site specific meteorological studies demonstrating the complexity of weather at this site. Pilgrim should update to Class B models and multiple weather stations. (PNPS-AC)

Comment: A straight line Gaussian model is not applicable here and the applicant should not rely on weather input data simply from that obtained onsite. By relying on the steady-state, straight –line Gaussian model to construct a "key hole" planners are likely to make the wrong call - send citizens into a plume; tell folks to stay put when should evacuate; or tell them to evacuate when should shelter. Class B models must be required if a license extension is granted for 2012-2032. Computerized combination weather-radiation monitors are readily available and also must be required. (PNPS-AC)

Comment: The meteorological input to the modeling tool used by Entergy to characterize weather conditions, and therefore the radiological consequences from a severe accident at the Pilgrim plant, are inaccurate.

While Pilgrim's Meteorological Monitoring System currently meets applicable Commission requirements, the ER's straight-line Gaussian plume model to estimate the location and magnitude of predicted radionuclide concentrations and resultant doses received from a postulated plant accident is inappropriate for the Pilgrim station. With the Gaussian plume model, the speed and direction of prospectively lethal clouds are determined by the initial wind speed and the direction at the time of release and do not account for variable atmospheric conditions, whether in time or in space. Further, the model does not consider terrain effects, which can significantly affect wind patterns and dispersion/ Variable wind conditions over time and space, likely in the coastal, hilly terrain are surrounding the Town, makes the resultant predictions of the movement of lethal airborne materials based on just onsite meteorological data, with simplistic straight line air quality dispersion models, severely unreliable for evacuation planning purposes. (PNPS-AE)

Response: *Emergency planning decisions at Pilgrim would be based on the Pilgrim Emergency Plan. 10 CFR Part 50.47 requires that the Emergency Plan provide adequate*

methods, systems, and equipment for assessing and monitoring actual or potential off-site consequences of a radiological emergency condition. The Pilgrim Emergency Plan, including meteorological and dose projection capabilities, has been reviewed by the NRC and found to meet all regulatory requirements. The comments provide no new and significant information, and are not within the scope of license renewal under 10 CFR Part 51 and Part 54. Therefore, they will not be evaluated further.

Comment: The assumptions in the models used by the applicant and the input data put into those models do not provide credible conclusions regarding emergency response outcomes in a severe accident. Nor is there reasonable assurance that the assumptions used by FEMA in this area have any credibility. The MACCS2 emergency planning model requires the user to input the time when notification is given to emergency response officials to initiate protective actions for the surrounding population; the time at which evacuation begins after notification is received; and the effective evacuation speed. However, the model assumes that the population is out of danger once crossing the 10-mile boundary. This will not be true in a severe accident such as a core melt and/or a spent fuel pool accident that leads to a zirconium fire. Safety and Security of Commercial Spent Nuclear Fuel Storage Public Report, National Academy of Sciences, 3 (April, 2005).

In addition, the model does not consider those who cannot evacuate and must shelter. Protective actions involve both evacuation and sheltering. Under some circumstances evacuation will not be possible for all or a portion of the affected population. The elderly often require transportation assistance because they are infirm, cannot drive themselves or have only one car per household that may not be available in an emergency.

The applicant's evacuation time input data is from, Pilgrim Station Evacuation Time Estimates and Traffic Management Plan Update, Revision 5, (November 1998). However later data is available. KLD prepared a later report for Entergy, Pilgrim Nuclear Power Station Development of Evacuation Time Estimates, KLD TR-382, Revision 6, (October 2004). The newer KLD study relies on newer census data and newer roadway geometric data. The most recent data available should be used as source material to get the most accurate estimates.

Many of the assumptions and study estimates in the applicant's source, Pilgrim Station Evacuation Time Estimates and Traffic Management Plan Update, Revision 5, (November 1998) are faulty. For example, voluntary evacuation from within the EPZ was estimated to be 50% within a 2-5 mile ring around the reactor, excluding the "key-hole;" and 25% in the annular ring between the 5-mile boundary of the circle and the 10-mile EPZ boundary. Shadow evacuation was not considered. Special Events, such as the July 4th celebration, were not considered. Evacuation time estimates for the EPZ was performed for, "Off-season mid-week, mid-day in good weather; and summer mid-week, mid-day, good weather." Using the above false assumptions, the study describes unrealistically low evacuation time estimates. Clearly

there is no guarantee that an accident will not occur on holidays, during the commuter rush hour, on summer week-ends, or in bad weather. Emergency planning and a severe accident analysis should assume the worst case scenario. (PNPS-AC)

Response: *The commenter raises questions regarding the adequacy of various input data and assumptions used in the MACCS2 off-site consequence analysis, including: estimated times to notify emergency response officials and to initiate and complete evacuation, the portion of the population that does not evacuate, the impacts of a "shadow evacuation" in which persons outside the evacuation zone voluntarily evacuate, and the impact of transient population. The MACCS2 analysis will be addressed in Chapter 5 of the SEIS.*

The commenter also states that the severe accident analysis should assume the worst case scenario. The staff disagrees. As stated in the Commission's Policy Statement on Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities, PRA evaluations in support of regulatory decisions should be as realistic as practicable. Similarly, the Regulatory Analysis Guidelines of the NRC call for the use of best estimate values. Reliance on best estimate rather than worst case assumptions in the SAMA analysis is consistent with this guidance.

Comment: The sea breeze phenomena are observed at the Pilgrim site. A sea breeze is a localized wind that blows from the sea to the land. It is caused by the temperature difference when the sea surface is colder than the adjacent land. Therefore, it usually occurs on relatively calm, sunny, spring and summer days. Depending on topography, intensity of solar heating and pressure gradients, a sea breeze front can penetrate inland from 1(.5 miles) to 15 km (9 miles). It can occur throughout the year but it occurs most frequently during the spring and summer months. On average Pilgrim experiences about 45 sea breeze days during these two seasons.

Typically onshore component commences about 10:00 AM and can persist to about 4 PM. The wind direction changes during the day veering from the north around through the southeast quadrant by late afternoon. The intensity of the sea breeze can be measured by the wind speed and distance of inland penetration. The intensity of the sea breeze circulation depends upon solar radiation (which is influenced by cloud cover), sea water temperature, and strength of the gradient wind flow. The intensity and effective inland penetration of the sea breeze front in the near environment of the Pilgrim site are not well characterized. (PNPS-AC)

Comment: Coast line orientation and topography strongly influence wind patterns (the frequency, direction, and strength of onshore winds). Predominantly in the summer and spring, a sea breeze onshore component is observed along the Massachusetts coast. The dominant sea breeze components are east and east-southeast for Boston-Logan, easterly for Plymouth, northeast and east-northeast for the Canal site, and east and east-southeast for the Pilgrim

plant. This finding suggests that the wind speed and direction at one coastal site would not be used as a surrogate for other coastal sites. (PNPS-AC)

Comment: The meteorological sites available provide limited ability to fully characterize or model the sea breeze circulation in the vicinity of the Pilgrim Nuclear Power Plant.

Physical modeling of coastal sea breeze circulation patterns is limited by both the number of meteorological sites in the vicinity of the Pilgrim Plant and the number of parameters monitored.

William T. Land, Meteorological Analysis of Radiation Releases For the Coastal Areas of the State of Massachusetts for June 3rd to June 20th 1982 A listing of probable causes resulting in radiation concentration within the microclimate would include (in order of importance):

1. ONSHORE WINDS: Winds from the east and north moving radiation back toward the land away from the coast.

2. WIDESPREAD RAINFALL; Rain which could keep radiation in the lower stratosphere and washout radiation into the ecosystems, food chair and water supplies.

3. COOL DESCENDING AIR; Air which would prohibit radiation from lifting into high altitude winds which would in turn carry the contaminants at the 18,000 foot level safely out to sea.

4. AIR POLLUTION: Pollution which would give added nuclei for radiation to adhere to thereby increasing its ability to stay at lower stratospheric levels.

5. FOG: Fog which would give additional hydroscopic nuclei for both pollution and radiation to coalesce upon.

6. AIR STAGNATION: Stagnation with little or no wind, haze and temperature inversions which in turn have the ability to trap radiation close to the surface. (PNPS-AC)

Comment: Winds along the coast of Massachusetts, and therefore the Town, are significantly affected by the sea breeze effect, which is critically important in estimating contaminant exposures in coastal areas. During moderate to strong wind conditions, such as those associated with coastal storms, approaching warm fronts, or after the passage of cold fronts, the wind direction throughout the region should be fairly uniform as would be depicted from one of Entergy's meteorological towers. However, abrupt wind direct shifts and wind speed changes can occur during the passage of such large-scale weather systems throughout the region. When wind speed starts to get lighter (e.g., below 5-10 mph), and depending upon the time of day and season, the terrain also will affect regional wind patterns in a more pronounced manor. During the spring and summer months whenever day-to-day large-scale regional

weather influences are absent (storms and fronts), strong temperature contrasts between the warmer land and the colder Cape Cod Bay can result in sea breeze conditions on sunny, fair weather days. At times, sea breeze influences can penetrate miles inland. Weaker land breezes also can occur during other times, particularly at night, when the land surface is colder than the water body surface. Shifting wind patterns (including temporary stagnations, recirculation, and wind flow reversals) can occur during these daily sea and land breeze conditions, and can persist for several hours. Any shifting wind patter away from Pilgrim could produce a different plume trajectory (and resultant concentrations and radiological doses at specific locations) than what the application depicts. (PNPS-AE)

Response: *These comments raise questions regarding the adequacy of various input data and assumptions (i.e. meteorological data) used in the MACCS2 off-site consequence analysis. The MACCS2 analysis will be addressed in Chapter 5 of the SEIS.*

A.1.7 Comments Concerning Alternative Energy Sources

Comment: ...wind power, solar power, fuel, gas, gas fuel, as far as bringing it into Fall River, bringing it into Boston Harbor, all of these things are not something that anybody wants to have...The fact is that we have to have alternative energy and if nuclear is not the safest, then I think we have to find out what's better and, as we have proposed just about everything, we have had situations that have caused us to get more and more limited. I don't think we can protect ourselves from just about anything that we are dealing with. (PNPS-V)

Comment: And I think that when we are talking about fossil fuels, we have to consider that there is a risk in everything, there is a risk in everything in our environment. (PNPS-V)

Comment: We have gone from the point where we were heating our homes with firewood, and we went to coal, we didn't like that, we went to oil. We are now into the nuclear age and, as far as its concerned, I would just like to know and I think perhaps people from some of the, some of the people who are providing studies is what are the alternatives? (PNPS-V)

Comment: Let's have a wind farm out in Nantucket Sound, you are not going to have any problems there. There is no NRC to oversee a wind farm because there is no problem with a wind farm as serious as the problem that exists with the radioactive substances that we are using today in these reactors. (PNPS-Z)

Response: *The comments are related to the environmental impacts of alternatives to license renewal at PNPS. The GEIS included a discussion of alternative energy sources. Environmental impacts associated with various reasonable alternatives to renewal of the PNPS operating license will be evaluated in Chapter 8 of the SEIS.*

A.1.8 Comments Concerning Monitoring Programs

Comment: I hope, in that, you will also be looking at the necessity in the future, and actually now, for better monitoring to assess whether the current environmental monitoring program reports are reliable and accurate, whether, instead, we need to include more sampling to have another look at where control and indicator stations are place and also to consider, in the future, whether it's appropriate to have the licensee get the samples, and have their own labs analyze the samples and to provide the reports, whether a system would better protect health and public safety, for 2012-2032, what would you advise? (PNPS-A)

Comment: High School Monitoring Project - This system consists of radiological and meteorological monitoring systems at each of seven high schools [3 in Plymouth; 1 each in Carver, Kingston, Duxbury and Marshfield]. These on-line monitoring stations are connected by modem to each other and to MDPH.

Deficiencies:

- This program was initiated by the Governor's Council on Radiation Protection solely as a teaching device for the students, not as a monitoring device to protect public health and safety. They recognized that this important job could not be left to a changing collection of teachers, students or janitors, working part-time and not trained technicians.

- It is overly optimistic to assume that the schools are all coincidentally placed in the most favorable locations in regard to population density and meteorological conditions.

- The High School monitors, like the Sage, have poor sensitivity to low energy gamma and beta. To be protective of public health they should measure gamma, beta and alpha radiation, at both the high and low energy levels. For example Iodine-125 is at the 60 KeV and most iodine's are less than 100 KeV.

- Calibration and testing of equipment is not adequately and consistently performed. (PNPS-AC)

Comment: The ER must analyze the accuracy and reliability of Pilgrim's monitoring and reporting in order to accurately assess what impact Pilgrim actually has had on the environment and is likely to have in the future.

We contend that in order to have any reasonable assurance that public health and safety will be protected 2012-2032, the following changes in the monitoring program must occur.

Environmental monitoring program must be changed as follows:

- Control stations actually placed outside the area of Pilgrim's influence - outside Emergency Planning Zone [EPZ] communities;

- Number and type of samples expanded;

- Split samples provided to an in independent source;

- Analysis and reports performed by an independent laboratory, not one owned by the applicant;

- Monitoring wells installed to test for groundwater contamination and migration placed onsite, especially along the edge of Cape Cod Bay. Monitoring air emissions modified to include:

- Off-site releases - upgrade equipment by installing combination weather/ radiation detection and measurement devices, fix-mounted to provide real-time measurements, placed in appropriate locations as determined by a site-specific meteorological study;

- On-site monitors upgraded.

Multidimensional plume dispersion models, Class B Models; and multiple meteorological towers placed in the seven surrounding towns [Carver, Duxbury, Kingston, Pembroke, Plymouth, and Plympton] and on Cape Cod according to site specific meteorological analysis performed, for example, for the Commonwealth by Dr. J.D. Spengler and Dr. Bruce Eagan. (PNPS-AC)

Comment: Radiation detectors are located at exit points from the plant to measure gaseous radioactive effluents. These detectors monitor the gross gamma radiation of gaseous effluents as they pass by. These readings are monitored and recorded in the control room, and when the radiation level approaches release limits, either the effluents can be diverted to another system for further processing, or the power level of the reactor can be reduced in order to reduce the amounts of radioactivity produced. The radiation detectors are sensitive only to the total amount of radiation impinging on them, they don't differentiate between one isotope and another, since there are substantial assumptions regarding short half-lives of isotopes entering the systems. One fundamental limitation to measuring gamma radiation levels exiting the plant ventilation systems is that a small perturbation in the total amount of radiation detected, since the decay rate is so much lower compared to short half-life isotopes. In this way, a leak of long half-life isotope could go undetected by a radiation detector. The use of chemical and gamma spectrographic analysis is designed to augment the stack radiation monitoring program. (PNPS-AC)

Comment: Periodic sampling and analysis techniques are employed to determine the relative abundance of various isotopes that are being released. This is very important since the biological action and possible impact is quite different for different isotopes. The way this is carried out is that radioactive effluent is sampled by systems that employ filters and charcoal to draw air through them. After a given period of time, the contents of the filters and charcoal are analyzed by measuring the radioactive decay rate as a function of disintegration energy. Since isotopes decay by emitting radiation of characteristic energies, the amount of a given isotope present in the sample can be estimated by the magnitude of the number of disintegrations at characteristic energies. The uncertainties associated with this method are that in general isotopes emit a spectrum of radiation frequencies, and in a case where there are a large number of unknown isotopes present in the sample, the energy peaks can overlap for different species and it may not be possible to assay many isotopes with any accuracy. Another problem that can occur is that the efficiency of the charcoal absorber is strongly a function of relative humidity, so in cases of high humidity, the amount of a given isotope present in the charcoal may not at all reflect the concentrations in the sampled effluent. Detectors used to perform these measurements have non-uniform responses to different energy peaks, and calibration of these sensitive instruments should be conducted frequently. Finally, the raw measurements from these instruments are entered into equations to estimate actual release rates, so the associated uncertainties may be quite high. (PNPS-AC)

Comment: Off-site monitors to measure airborne emission of radionuclides from Pilgrim include: the Sage System consisting of 14 real-time monitors installed on the edge of Pilgrim's property; thermoluminescent docimeters (TLD's) placed in locations 0 to >15 km from Pilgrim; real-time monitors placed in a few schools for the sole purpose of educating students.

Sage System [Computerized "Ring" Monitors] – Deficiencies

- The Sage System does not provide any significant protection to the citizens of Southeastern Massachusetts. The "NRC Draft Report For Comment On Findings On Issues Of Off-site Emergency preparedness For the Pilgrim Nuclear Power Station [NUREG-1438], issued May 1991, expressly noted that MDPH installed this system, "even though fixed offsite monitors are no longer endorsed by the NRC..."[page 2-159].

- Under the agreement with Boston Edison Company [BECO], the previous licensee, the monitors were installed less than a quarter of a mile from the plant. Yet, the NRC has found that monitors closer than 1000 meters [about 2/3 of a mile] would provably provide inaccurate readings in the event of an accident.

- The agreement included 22 potential monitoring sites, but only 14 have been installed. Again this is contrary to NRC research on real time monitoring, which

concluded that using as few as 14 monitors would grossly underestimate the radiation from narrow emission plumes.

• The monitors are only in a small quadrant behind the plant. Therefore, there is no effective monitoring in the directions of Scituate, Marshfield, Duxbury, Kingston, or much of Plymouth [including the Gurnet, Saquish neck at the end of Duxbury r Beach.

• There are no monitors on Cape Cod. The Cape is across open water -- nothing to break up a plume.

• The placement of the Sage monitors effectively ignores the results of wind analysis done by the Harvard School of Public health, under the direction of Dr. J.D. Spengler and Dr. G.J. Keeler, May 12, 1988 that described the variability of coastal winds and that the sea breeze effect brought winds inland > 10 miles. Also a true ring of monitors is feasible. At Seabrook NPS, the Citizens Monitoring Network is installing monitors on buoys at sea.

• The Sage monitors do not measure high and low let alpha and beta radiation.

• The placement of the Sage monitors effectively ignores the results of wind analysis done by the Harvard School of Public health, under the direction of Dr. J.D. Spengler and Dr. G.J. Keeler, May 12, 1988 that described the variability of coastal winds and that the sea breeze effect brought winds inland > 10 miles. Also a true ring of monitors is feasible. At Seabrook NPS, the Citizens Monitoring Network is installing monitors on buoys at sea.

• The Sage System lacks software to make sense out of the computer data arriving at Massachusetts Department of Public Health [MDPH]. The data has not been systematically graphed, charted or reported to the public. (PNPS-AC)

Comment: Plutonium historically have been found in Duxbury Bay sediment samples; Entergy has attributed the Plutonium to either weapons testing, cross-contamination from their lab's glassware or simply lost the sample.

It seems far more likely that the plutonium is from Pilgrim which is visible from Duxbury - rather than from a Chinese bomb launched thousands of miles away. It would be coincidental if the beaker used to test the sample at Entergy's own lab just happened to be improperly cleaned and just happened to be contaminated with Plutonium. It seems coincidental that the next years' plutonium sample happened to get lost. This is one reason Petitioners believe that the Applicant should not be responsible for its own environmental testing – the samples should be sent to an independent lab. (PNPS-AC)

Comment: Beginning in July 2002 Pilgrim began to use Entergy's J.A. Fitzpatrick Environmental Laboratory for analysis of environmental samples. Petitioners contend, and are prepared to demonstrate to the ASLB, that results can vary considerably depending on who analyzes the data and reports the findings. A clear conflict of interest is present when the applicant's own company both analyzes the data and reports the results. (PNPS-AC)

Comment: The Radiological Environmental Monitoring Program reports can not be relied upon to produce accurate data. The Applicant collects the samples to determine Pilgrim's radiological impact on the general public. The "control stations" are too close to the reactor; in actuality, they are indicator stations. Fewer sample media and numbers now are taken than before; fewer are required. Since July 2002, the Applicant's own laboratory analyzes the samples for radioactivity. Reports for the NRC and public are prepared by the Applicant, Entergy. Finally high deposition of radiation found is attributed by Entergy to sources other than Pilgrim. (PNPS-AC)

Comment: The environmental sampling media collected in the vicinity of PNPS and at distant locations included air particulate filters, charcoal cartridges, seawater, shellfish, Irish moss, American lobster, fishes, sediment, milk, cranberries, vegetation, and animal forage."

The sampling locations are divided into two classes, indicator and control. Indicator locations are those that are expected to show effects from Pilgrim operations. The REMP states that while the indicator locations are typically within a few kilometers of the plant, the control stations should be located so as to be outside the influence of Pilgrim Station. However, many control stations are too close to Pilgrim - within sight of the reactor and within the official Emergency Planning Zone Communities, [10 miles or 16 kilometers]. In reality they are indicator stations. If radiation is above expected in a sample collected from a "control station" it is attributed to weapons fallout, not Pilgrim. Also the location of the "control stations" ignores the fact that radioactive particulates released to the air from the stack, will be carried by the wind some distance and deposited some distance from the reactor site –in the control locations. (PNPS-AC)

Comment: Milk, a key indicator, is no longer sampled. Prior to 2000, milk samples were obtained from an indicator station, Plymouth County Farm, and from a control station located in Whitman. Plymouth County Farm stopped milking cows and since that time Entergy has claimed that they could not identify any additional milk animals within 5 kilometers [3.1 miles] of Pilgrim. Petitioners contend that milk samples > 5 kilometers could be indicator stations. Additionally there are farms nearby. Plymouth Plantation is about 3 and ½ miles from Pilgrim and has a farm with lactating cows and goats. The oldest operating dairy farm in the Northeast is located in Duxbury. Entergy's claim that Plymouth Plantation can not provide sufficient milk has not been proven. Exactly how much is required, at minimum, for each test? We request this information to verify with independent laboratories. (PNPS-AC)

Comment: In regard to terrestrial sampling, routine collection and analysis of soil samples was discontinued; instead they claim that if air sampling showed an early indication of any potential deposition of radioactivity, follow-up soil sampling could be performed on an as-needed basis. However, this assumes that the air monitoring is reliable and accurate.

In the area of marine sampling, the following changes were made.

- A sample of the surface layer of sediment is collected, as opposed to specialized depth-incremental sampling to 30 cm and subdividing cores into 2 cm increments.

- Standard LLD levels of about 150 to 180 pCikg were established for sediment, as opposed to the specialized LLDs of 50 pCi/kg.

- Specialized analysis of sediment for plutonium isotopes was removed.

- Sampling of Irish moss, shellfish, and fish was rescheduled to a semiannual period, as opposed to a specialized quarterly sampling interval.

- Analysis of only the edible portions of shellfish (mussels and clams), as opposed to specialized additional analysis of the shell portions.

- Standard LLD levels of 130 to 260 pCVkg were established for edible portions of shellfish, as opposed to specialized LLDs of 5 pCVkg.

Petitioners contend that what was discontinued has resulted in the loss of important data that is required, "to assess the impact of Pilgrim Station on the environment and on the general public." And what was discontinued appears to be connected to elevations of radioisotopes in the environment found in previous years. (PNPS-AC)

Comment: I believe we have very, very little data monitoring radiation in the area. There may be occasional radiation monitors at the plant but, for instance, in Duxbury, we don't have any radiation detectors, so I think I hear people say that even during, if we had any kind of an event, it would be very important for us to know where, if there is a radiation release, where is it going and is it in fact in Duxbury, or is it in Carver or is it in Plymouth? So I think, as one of the mitigation things that I would like to very strongly request, is that radiation monitors be put throughout the area, and many of them. And it would be, I think, in Pilgrim's interest to have that because if, as I think they claim, that radiation is not being disseminated around, that would certainly prove their point. If there is nothing being measured, then that's great for all of us to know. (PNPS-L)

Comment: And third, in assessing health, you would look at, as BEIR VII said, to bioaccumulation and the cumulative effect of health impact by looking at what is documented in the REMPs of how much radiation has been released, and also pay special attention to what was stated by Mass. Department of Public Health in a public meeting that Senator Kerry held, that there is no reason, I can provide the exact quote later, no reason to trust what the licensee has put into their reports of what has been emitted and "they have emitted far too much than they should have" including, for example, transgeneric elements such as neptunium. (PNPS-A)

Comment: The effects of radiation exposure are cumulative. Some types of nuclear power plant emissions stay radioactive for a long time and, because they can enter biological food chains, those materials can accumulate in the environment and adversely affect public health. "If radioactive emissions persist for years, decades or even centuries within the environment, then even modest reductions in annual discharges may not be sufficient to prevent an environmental build up of those materials over time." Estimates of Environmental Accumulations of radioactivity Resulting from Routine Operation of New England Nuclear Power Plants (1973-84), Dr. Richard W. England, Mr. Eric Mitchell, p.4, A Report of the Nuclear Emission Research Project, Whittemore School of Business and Economics, University of New Hampshire, Durham, N.H., August 1987.

It is known for example that the following radionuclides have been released from Pilgrim into neighboring communities: plutonium 239 (half life 24,400 years); neptunium 236 or 237 (half life ranging from 120,000 years -2.1 million years); cesium 137 (half life 30.2 years); strontium 90 (half life 28.5 years); tritium (half life 12.3 years), and xenon (half life 9.17 hours). Xenon transforms after its emission into cesium 135, which persists almost indefinitely in the environment. Examples of previous releases have been reported in the Annual Radiological Environmental Monitoring Program Reports [REMP]. These releases include substances that will remain active in the local environment for the foreseeable future and should be taken into account when actual on-going doses to the public are evaluated. (PNPS-AC)

Comment: We would like to submit that if Applicant, NRC or current MDPH spokespersons dispute a causal link between the radiation released by Pilgrim and the cancers seen in its neighboring towns, the current systems in place to monitor releases are inadequate and must be improved if re-licensing is to be considered. The Comments to the Southeastern Massachusetts Leukemia Study made by Dr. Richard Clapp illustrate this point: I would like to reiterate a point that Drs. Knorr and Morris [Massachusetts Department of Public Health epidemiologists, authors of the Southeastern Massachusetts Health Study] made to you in one of their memoranda, e.g., that the emissions data provided by the utility are not reliable. I have had numerous discussions with individuals in the Department of Public health as well as colleagues who previously worked in a job monitoring worker exposure to Pilgrim contractors in the mid-1970's. From these discussions, I am convinced that the actual emissions were considerably worse than what has appeared in public documents and has been available to

researchers to date. In particular, there were transuranic isotopes released that should never have been emitted to the general environment." Richard C. Clapp, MPH,Sc,D., Statement before the Southeastern Massachusetts health Study Review Committee, (June 26, 1992). In the years since that statement was made, the quality of the environmental monitoring by Pilgrim has, if anything, decreased. (PNPS-AC)

Comment: The public can not be required to prove a causal link between the radiation released and the statistically significant increase in cancers if there is no effective monitoring system in place to measure those releases nor can the Applicant claim that a causal link does not exist.

As stated previously, the system in place to monitor off-site radiological releases at Pilgrim is inadequate. Although there are documented increases in radiation-linked cancers in the communities around the plant, this aging plant does not use monitors which would allow state or federal authorities to confidently measure radiation releases. Some of the deficiencies of the monitoring system currently used by Pilgrim are described in the following section, as well as needed improvements that need to be made to the Pilgrim environmental monitoring program. (PNPS-AC)

Comment: Pilgrim began operations in 1972 with defective fuel. The Massachusetts Department of Public Health's Southeastern Massachusetts Health Study 1978-1986 stated, "Pilgrim, which began operations in 1972, had a history of emissions during the 1970s that were above currently acceptable EPA guidelines as a result of a fuel rod problem." Southeastern Massachusetts Health Study 1978-1986, Morris M.S., Knorr R.S., Executive Summary, Massachusetts Department of Health (October, 1990).

In the March 2005 and April 2006 Pilgrim SALP (Systematic Assessment of License Performance, performed by the NRC) Reports, NRC Resident Inspector, William Raymond, stated that Pilgrim operated in 2004 and 2005 with defective radioactive fuel – that is, fuel with perforated cladding. We do not have information one way or another whether defective fuel was used in other previous years. Fuel cladding provides the first barrier to prevent radiation from getting out and harming workers and the public. Degraded fuel is an on going issue for the industry. NRC Commissioner Merrifield has admitted nearly 1/3 reactors now have failed fuel, and the trend is increasing, not decreasing. Briefing on Nuclear Fuel Performance, Transcript, p.4, (February 24, 2005), http://www.nrc.gov.

Use of degraded fuel will increase exposure to both the public and workers. For example, according to the NRC, "a plant operating with 0.125 percent pin-hole fuel cladding defects showed a general five-fold increase in whole-body radiation exposure rates in some areas of the plant when compared to a sister plant with high-integrity fuel (<0.01 percent leaks). Around certain plant systems the degraded fuel may elevate radiation exposure rates even more."

United States Nuclear Regulatory Commission, Information Notice No. 87-39, Control Of Hot Particle Contamination At Nuclear plants, (August 21, 1987). (PNPS-AC)

Comment: If radioactivity is discovered that could be attributed to Pilgrim, the response is to attribute the contamination to other sources and/or request NRC to change the monitoring requirements.

Example, Milk: Milk historically showed elevated levels of contamination. However as mentioned above milk is no longer tested, although lactating animals are available in the area at Plymouth Plantation approximately less than 5 miles away and at a dairy farm in Duxbury, within the Emergency Planning Zone.

Previously milk was tested in farms near Pilgrim and at a control station in Whitman, 22 miles away. The Radiological Environmental Monitoring Program Report (REMP) for 1980 noted that, at the farms around Pilgrim, "the measured average concentration of both Cesium-137 and Sr-90 were respectively 10,000 and 1,000,000 times in excess of the concentrations expected to be present…" and went on to say that this "is unquestionably due to atmosphere testing." The effort to blame the increase on "atmosphere fallout" ignores a critical fact – no similar increase was experienced at the control station in Whitman.

The 1982 REMP report stated that the highest mean value occurred at the Kings Residence, located < 5 miles from Pilgrim, in late June 1982. There were concentrations greater than 1,000,000 times in excess of the concentration expected. The report, written by Tom Sowden [who continues to work in this area at PNPS] stated,

It is not uncommon to find marked increase of Cs-137 associated with the cow's pregnancy, and this was most likely the cause.

However the large animal expert at Tufts Veterinarian School was of a different opinion. He stated that,

Cows normally do not lactate during pregnancy. And, an animal can not produce Cs-137 on their own. It (Cs-137) must be introduced into the cows system from an environmental source. The cow would have to ingest it in some way." (PNPS-AC)

Comment: TLD's - Thermoluminescent dosimeters placed in offsite locations ranging from 1 km (.6 miles) to > 15 km (9.3 miles) to measure gamma radiation levels. These devices are passive in as much as they must be in place for a period of time [3 months] and then brought back to the laboratory to determine the amount of radiation the device received at that location for that period of time.

Deficiencies TLD's

- TLD's provide only an average figure, and increases of potential significance can be masked by lower than average readings during other parts of the month. Biological impact occurs on a daily basis.

- TLD's can only read to a maximum threshold, that is, like a film badge they can only read so high.

- TLD's do not read high or low let alpha and beta.

- Dr. Hoffman, at Penn State, did an analysis of TLD's and concluded they provided poor sensitivity to Zenon 133. He said it took about 85 hours at maximum concentration before anything showed up and that even then the amount was underestimated by a factor of around 20. (PNPS-AC)

Comment: Entergy states that "[v]ery low levels of radioactivity may be released in plant effluents if they meet the limits specified by NRC's regulations. These releases are closely monitored and evaluated for compliance with the NRC restrictions in accordance with the PNPS Offsite Dose Calculation Model." This implies that there will be no danger to public health from routine releases since they will be monitored and will not exceed federal limits. However, the system in place to monitor radiological releases at Pilgrim is inadequate and could result in a health hazards to residents in the Town and neighboring areas. (PNPS-AE)

Comment: These communities are also downwind from the Camel Electric Plant and there has been significant pesticide use in the agriculture. So, we have been exposed and will continue to be exposed to a multiplicity of toxins that will work together. Also, no one denied the fact that 1982, when Pilgrim had a severe accident of blowing its filters, that that damaging effect is still here. Many of what never should been released radionuclides, with long half lives, are still in our environment. (PNPS-N)

Response: *The comments relate to monitoring of radiological effluents at Pilgrim. As required by NRC regulations, the amounts of radioactive isotopes released from Pilgrim in liquid and gaseous effluents are constantly monitored and recorded by Entergy. The meteorological conditions at the site also are constantly monitored and recorded. Health physics experts from NRC's Region I office routinely inspect these monitoring programs to ensure that they are being properly implemented. All of this information is fed into calculational models that estimate the amount of radiation dose a member of the public might receive. The calculational models are in the ODCM and have been reviewed and approved by the NRC. These models include estimates of dose from internally deposited radioactive isotopes as well as direct radiation exposure. In addition, Entergy conducts an environmental radiological monitoring program in*

the area around Pilgrim. This program has also been reviewed and approved by the NRC and is inspected by the health physics experts from NRC's Region I office. In addition, changes to the program, such as the decision to suspend milk sampling because a large enough sample size is not available, are also reviewed by the NRC as part of the inspection program. The environmental radiological monitoring program samples and measures the amount of radioactive isotopes in the air, water, soil, agricultural products, shoreline sediments, and aquatic biota and measures direct radiation from the plant using thermoluminescent dosimeters (TLDs). The NRC finds the use of TLDs for the purpose of routine monitoring around nuclear power plants to be acceptable. This program confirms that the levels of radioactive isotopes in the environment that are predicted by the computer dose models. This program will also identify any radionuclides that may be accumulating in the environment around Pilgrim.

Licensees also must participate in an interlaboratory comparison program, which provides an independent check of the accuracy and precision of environmental measurements. The quality assurance laboratories for J.A. Fitzpatrick Laboratory are Analytics, Incorporated in Atlanta, Georgia, and the U.S. Department of Commerce's National Institute of Standards and Technology in Gaithersburg, Maryland. Also, the Massachusetts Department of Public Health conducts an environmental radiological monitoring program around Pilgrim.

As part of the review of the license renewal application for Pilgrim, the NRC will review the annual radiological effluent reports and the annual environmental radiological monitoring reports for the last several years at Pilgrim. All of these reports are available to the public on the NRC's ADAMS document retrieval system. The NRC will also review information from the Commonwealth's monitoring program.

While Pilgrim may have experienced significant fuel defects and released transuranic radioisotopes earlier in plant operation, NRC believes that the recent effluent reports are the best source of information to help estimate the amount of each type and total amount of radioactive materials that will be released from the plant during the license renewal period. Chapters 2 and 4 of the SEIS will address NRC's assessment of the radiological effluents and impacts that are expected during the license renewal period.

Comment: The EIS should also catalogue other (i.e., non-thermal) pollutant discharges by Pilgrim Station and assess their environmental effects. These other pollutants may include chlorine or other biocides, copper, radionuclide, metals, or other contaminants. Again, EPA has information on some of these pollutants in its NPDES permit files, but the NRC could update this information as needed and likely has more information regarding radionuclides or better access to such information than EPA does. (PNPS-AG)

Response: *The National Pollutant Discharge Elimination System (NPDES) permit, which is issued by EPA, designates the chemicals, such as biocides and metals, and the amounts of*

those chemicals that are allowed to be released by Pilgrim. NRC will review the NPDES permit as part of its evaluation of the potential environmental impacts of license renewal for the purposes of NEPA. These impacts will be discussed in Chapters 2 and 4 of the SEIS. In addition, Chapters 2 and 4 of the SEIS will include NRC's assessment of radiological effluents and impacts that are expected during the license renewal period.

Part II. Comments Received on the Draft SEIS

Pursuant to 10 CFR Part 51, the staff transmitted the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Pilgrim Nuclear Power Station, Draft Report for Comment* (NUREG-1437, Supplement 29, referred to as the draft SEIS) to Federal, State, Native American Tribal, and local government agencies as well as interested members of the public. As part of the process to solicit public comments on the DSEIS, the staff:

- placed a copy of the DSEIS in the NRC's electronic Public Document Room, its license renewal website, Plymouth Public Library, Duxbury Free Library and Kingston Public Library,
- sent copies of the DSEIS to the applicant, members of the public who requested copies, and certain Federal, State, Native American Tribal, and local agencies,
- published a notice of availability of the DSEIS in the *Federal Register* on December 14, 2006, (71 FR 75280),
- issued press releases and public announcements such as advertisements in local newspapers and postings in public places announcing the issuance of the DSEIS, the public meetings, and instructions on how to comment on the DSEIS,
- held public meetings in Plymouth, Massachusetts, on January 24, 2007, to describe the results of the environmental review and answer related questions,
- established an e-mail address to receive comments on the DSEIS through the Internet.

During the DSEIS comment period, the staff received a total of 21 written sets of comments. Eighteen commenters spoke during the public meetings. The staff reviewed the public meeting transcripts and the comment letters that are part of the docket file for the application, all of which are available in the NRC's Agencywide Documents Access Management System (ADAMS). ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html. The ADAMS accession number for the public meeting summary, which includes the complete meeting transcripts, is ML070590260. Appendix A, Part II, Section A.2, contains a summary of the

comments and the staff's responses. Appendix A, Part II, Section A.3, contains the comment letters and a summary of the transcripts.

Each comment identified by the staff was assigned a specific commenter identifier (marker). That identifier is typed in the letter's margin at the beginning of the comment discussion.

Table A-2. Individuals Providing Comments During Public Meetings and Comment Period

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
PNPS-D-A	Sherwood Martinelli	Stakeholder for Pilgrim Nuclear Reactor	Written Comments
PNPS-D-B	Joan Bartlett	Local resident	Written Comments
PNPS-D-C	Lilias Cingolani	Local Resident	Afternoon Public Meeting
PNPS-D-D	Mary Lampert	Pilgrim Watch	Afternoon Public Meeting
PNPS-D-E	Joyce McMahon	Massachusetts Affordable Reliable Electric Alliance	Afternoon Public Meeting
PNPS-D-F	Robert Ruddock	Associated Industries of Massachusetts	Afternoon Public Meeting
PNPS-D-G	Rebecca Chin	Former Chairman of the Duxbury Board of Health	Afternoon Public Meeting
PNPS-D-H	John Stobierski	South Shore Chamber of Commerce	Afternoon Public Meeting
PNPS-D-I	Pine duBois	Jones River Watershed Association	Afternoon Public Meeting
PNPS-D-J	Ben Morgan	Local Resident	Afternoon Public Meeting
PNPS-D-K	Heidi Mayo	Local Resident	Afternoon Public Meeting
PNPS-D-L	Arthur Gast	Former Member Nuclear Matters Committee	Afternoon Public Meeting
PNPS-D-M	Mary Lampert	Pilgrim Watch	Afternoon Public Meeting
PNPS-D-N	Bob Haynes	Massachusetts AFL-CIO	Evening Public Meeting
PNPS-D-O	Gary Sullivan	Pilgrim Nuclear Power Plant	Evening Public Meeting
PNPS-D-P	Joyce McMahon	Massachusetts Affordable Reliable Electric Alliance	Evening Public Meeting
PNPS-D-Q	Mary Lampert	Pilgrim Watch	Evening Public Meeting
PNPS-D-R	Bill Harris	Local Business Owner	Evening Public Meeting
PNPS-D-S	Brian Thurber	Clean Water Action	Evening Public Meeting
PNPS-D-T	Michael Scherer	Normandeau Associates	Evening Public Meeting

Duxbury Free Library

Table A-2. (Contd)

Commenter ID	Commenter	Affiliation (If Stated)	Comment Source
PNPS-D-U	Richard Rothstein	Plymouth Resident	Evening Public Meeting
PNPS-D-V	Bill Stone	Plymouth Resident	Evening Public Meeting
PNPS-D-W	Kevin Craig		Evening Public Meeting
PNPS-D-X	Rebecca Hall	Previous Plymouth Resident	Written Comments
PNPS-D-Y	Malcom MacNaught	Duxbury Resident	Written Comments
PNPS-D-Z	Heidi Mayo	Local Resident	Written Comments
PNPS-D-AA	Lilias Cingolani	Local Resident	Written Comments
PNPS-D-BB	Joseph A. Marino	Local Resident	Written Comments
PNPS-D-CC	Rebecca Chin	Former Chairman of the Duxbury Board of Health	Written Comments
PNPS-D-DD	Millie Morrisson	Duxbury MA Nuclear Advisory Committee	Written Comments
PNPS-D-EE	Mary Lampert	Pilgrim Watch	Written Comments
PNPS-D-FF	Frank Gorke	Environment Massachusetts	Written Comments
PNPS-D-GG	Alyssa Schuren	Toxics Action Center	Written Comments
PNPS-D-HH	Martha Coakley	Massachusetts Attorney General	Written Comments
PNPS-D-II	Robert S. Knorr	Massachusetts Department of Public Health	Written Comments
PNPS-D-JJ	Paul E. McCormack	Local Resident	Written Comments
PNPS-D-KK	Brian Thurber	Clean Water Action	Written Comments
PNPS-D-LL	Diana Woebcke	Massachusetts Resident	Written Comments
PNPS-D-MM	Stephen J. Bethay	Entergy Nuclear Operations, Inc.	Written Comments
PNPS-D-NN	Pine duBois	Jones River Watershed Association	Written Comments
PNPS-D-OO	Robert W. Varney	Regional Administrator, USEPA Region I	Written Comments
PNPS-D-PP	Mary Osborn		Written Comments

A.2 Comments and Responses

Comments and responses in this section are grouped in the following categories:

A.2.1	Comments Concerning the License Renewal Process	A-63
A.2.2	Comments in Support of License Renewal at Pilgrim Nuclear Power Station	A-69
A.2.3	Comments in Opposition of License Renewal at Pilgrim Nuclear Power Station	A-72
A.2.4	Comments Concerning Surface-Water Quality, Hydrology, Groundwater, and Uses Issues	A-75
A.2.5	Comments Concerning Aquatic Ecology, Terrestrial Ecology, General Ecology, and Threatened and Endangered Species Issues	A-77
A.2.6	Comments Concerning Human Health Issues	A-112
A.2.7	Comments Concerning Socioeconomic Issues	A-125
A.2.8	Comments Concerning Land Use Issues	A-127
A.2.9	Comments Concerning Postulated Accidents	A-129
A.2.10	Comments Concerning Uranium Fuel Cycle and Waste Management Issues	A-140
A.2.11	Comments Concerning Alternatives	A-161
A.2.12	Comments Concerning Editorial Issues	A-166
A.2.13	Comments Concerning Decommissioning Issues	A-183
A.2.14	Comments Outside the Scope of the Environmental Review for License Renewal: Safeguards and Security; Operational Safety; Aging Management; Need for Power; and Energy Costs	A-185

A.2.1 Comments Concerning the License Renewal Process

Comment: And I want to say, you know, that this is a wonderful opportunity, this civic engagement, the opportunity to speak in public about things that are so important to us and for somebody that has represented workers for 30 years here in the Commonwealth of Massachusetts, this is a good example, a good relationship with the company, and the union and the workers, doing good work for the community, so please relicense the Pilgrim Nuclear Power Station for the benefit of the community. Thank you very much. (PNPS-D-N)

Response: *This comment is supportive of the license renewal process but do not provide any new information. Therefore, no changes have been made to the SEIS.*

Comment: I'm going to try to limit my comments to what the NRC has done, what the staff have done specifically about the generic environmental impact statement because I don't think that this is an issue of whether the plant should be open or closed in the future, I think it's an issue of whether this statement has been adequately prepared, and whether all the issues have been adequately studied and whether there should be additional work done in terms of protecting the plant, so let's try to keep it at that level.

I don't get this thing that's repeated often in the study which is there is no new information. It's repeated in several sections that specifically concern me because I see new information and the two sections of the report where I don't see acknowledgment of new and significant information that concern me is, one, the section that deals with the environmental impact of the fuel cycle's radioactive waste and the second section is the environmental impact postulated accidents. There are fixable issues here, even given the new information that I believe exists, but what the NRC needs to do, I believe, is expose these issues and then force resolution of the issues. (PNPS-D-W)

Response: *The NRC staff determines whether an issue is new and significant after a thorough evaluation of the issue. New and significant information would involve an environmental issue that was not covered in the generic environmental impact statement for license renewal (GEIS) or codified in NRC's regulations. It could also be information that was considered in the analyses summarized in the GEIS but that leads to a finding of environmental impact that is different from the finding presented in the GEIS (and codified in 10 CFR Part 51).*

In addition, a number of issues are specifically precluded from consideration in the environmental review process. Two of these issues are the operational issues that require separate National Environmental Policy Act (NEPA) reviews (such as an independent spent fuel storage installation and site-specific spent fuel storage and disposal). The fact that these issues are outside of the scope of the PNPS SEIS does not mean that they are not being or have not been evaluated. They have or will be evaluated in a separate action. The Nuclear Waste Policy Act (NWPA) establishes the Federal government's responsibility to provide a place for the permanent disposal of high-level radioactive waste and spent nuclear fuel and the generators' responsibility to bear the costs of permanent disposal. The NWPA authorizes and requires the U.S. Department of Energy (DOE) to locate and build a permanent repository and an interim storage facility and develop a transportation system to safely link nuclear plants to the repository and interim storage facility. Until a permanent disposal facility is operational, the NRC's Waste Confidence Rule, found in 10 CFR 51.23, states that "the Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations. Further, the Commission believes there is reasonable assurance that at least one

mined geologic repository will be available within the first quarter of the twenty-first century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time."

In response to the second portion of the comment, the PNPS SEIS does address postulated accidents. However, incidents resulting from terrorist attacks are not considered postulated accidents and are outside the scope of the environmental review. The NRC and other Federal agencies have heightened vigilance and implemented initiatives to evaluate and respond to possible threats posed by terrorists, including the use of aircraft against commercial nuclear power facilities and independent spent fuel storage installations.

Comment: Evacuation Plans have been removed from Kingston Public Library—the only documents relative to nuclear power are the NRC newsletters. This is not acceptable. (PNPS-D-NN)

Response: *The comment is noted. In lieu of maintaining emergency public information at the Kingston's town library, Entergy has opted to distribute emergency public information, including evacuation plans, using the following methods:*

1. *Emergency Public Information Calendar*

   The Emergency Public Information Calendar is distributed annually by direct mail to residents within the 10-mile EPZ. The calendars include informational cards, which can be filled out by individuals who need special assistance. A list of such individuals, e.g., hearing-impaired, handicapped, or physically impaired, is maintained by the Kingston Emergency Management Director.

2. *Emergency Public Information Placard*

   To ensure the transient population is made aware of emergency information, the Emergency Public Information Placard is posted in public and recreational areas such as parks, campgrounds, beaches, marinas and tourist attractions. Some specific locations in the Town of Kinston where Emergency Public Information Placards are being maintained include the following locations: (1) Stop & Shop/Summer Hill Plaza; (2) Hannaford Supermarket & Pharmacy/Kingsbury Plaza ; (3) Camp Norse; (4) Camp Mishannock; (5) Town Landing; (6) Gray's Beach; (7) Fire/EMS Station — Pembroke Street; (8) Fire/EMS Station — Smith Lane; (9) Emergency Operations Center (EOC); (10) Town House; (11) Police Station; (12) Independence Mall (Management Office); (13) Department of Streets, Trees & Parks; (14) Senior Center; and (15) Post Office.

3. Verizon Plymouth/Marshfield/Duxbury/Kinqston/Carver/Plympton Telephone Directory

The Verizon Plymouth/Marshfield/Duxbury/Kingston/Carver/Plympton telephone directory includes an emergency information notice for the permanent and transient populations.

The above excerpt was taken from Part G, Public Information in the Town of Kingston Radiological Emergency Response Plan for Pilgrim Nuclear Power Station (revision 12, dated 07/2006).

Comment: Raw data and original reports are needed to provide independent evaluation of the conclusions reached by the staff. JRWA was not provided with monitoring data and reports, and found it was dissatisfied with the synopsis of data provided in the SEIS. When multiple reports were available, general data reporting did not seem to agree (i.e. Szal and Pilgrim Report #61). We request that raw data and the monitoring reports required by the NPDES permit be made available. We request that these documents be on deposit at local libraries, and/or that they be made available on-line. JRWA does not present itself as an expert on any of these matters. However, we were limited in our ability to get assistance for review and investigation given that we only had the conclusions of others to evaluate. Although the SEIS is instructive, conclusions made are impossible to evaluate without the benefit of the original material. As studies and reports are produced, we request a public repository contain information, monitoring data and environmental impact assessments of whatever nature, relative to PNPS. (PNPS-D-NN)

Response: *All raw data and original reports that were used in the preparation of the SEIS are referenced in the SEIS and/or the Site Audit Summary Report, which can be found in the NRC's Agencywide Documents Access and Management System (ADAMS) under Accession No. ML06270305.*

Comment: Finally, the Staff should confirm that under NEPA, the Staff is precluded from issuing a permit for renewed operation of the Pilgrim nuclear power plant unless and until the results of the rulemaking proceeding have been taken into account in the Pilgrim license renewal case. (PNPS-D-HH)

Response: *The comment is related to the Massachusetts Attorney General (MassAG) petition for rulemaking regarding the evaluation of environmental impacts of severe spent fuel pool accidents. Information regarding the MassAG's rulemaking petition, can be found at the following NRC website: http://ruleforum.llnl.gov/cgi-bin/rulemake?source=prm5110&st=petitions-a. Currently, on site spent fuel storage is considered a Category 1 issue, which was evaluated in the GEIS,*

NUREG-1437. In addition, the NRC staff did not find any new and significant information that would call the Category 1 issue, raised by the MassAG, into question. Therefore, no changes have been made to the SEIS.

NEPA does not preclude the NRC from renewing an operating license while a petition for rulemaking is pending. While this petition for rulemaking is under review by the Commission, it is the NRC's policy to continue the license renewal process, as set forth in 10 CFR Parts 51 and 54. If the Commission decides to change or rescind regulations regarding the review of on-site spent fuel pool storage during the license renewal review, as a result of the rulemaking petition, affected licensees would have to comply. Until such direction from the Commission is given to the staff, no changes to the license renewal process will be implemented. Therefore, no changes have been made to the SEIS.

Comment: ...the conclusion that the impacts are small, excepting for two species of fish, I feel result from two parts, one, by ignoring and misinterpreting new and significant information; second, by assuming the rules that were largely put in place in the 1970s currently and in the future are protected of public health and safety, are being followed to the T by the licensee and the NRC is assuring that it is. (PNPS-D-D)

Comment: NRC's conclusion results from ignoring new and significant information pertaining to Pilgrim that has occurred since NUREG – 1437 (GEIS) was written in 1996; and incorrectly assuming current NRC regulations are being met by the licensee and that the regulations, themselves, reflect current realities and are protective of public health and safety. (PNPS-D-EE)

Response: *These comments disagree with the staff's analysis approach and relates to the search for new and significant information during the environmental review. The environmental review was conducted in accordance with NUREG-1555, Supplement 1, Environmental Standard Review Plan Supplement 1: Operating License Renewal and the 10 Code of Federal Regulations Part 51.*

The NRC staff collected and reviewed information provided by the following: Entergy, various federal and state agencies, and mandated public comment periods. The staff reviewed the information collected to determine if there was any new and significant information related to NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Category 1, Category 2, or noncategorized issues applicable to PNPS. During the course of the environmental review, no new and significant information was identified for any Category 1, 2 , or noncategorized issues applicable to the Pilgrim site. This comment provides no new and significant information; therefore, no changes have been made to the SEIS.

Comment: When management at Pilgrim and other plants have been unable to meet safety criteria and 10 CFR rules, they have been granted exclusions, or the NRC issues general issue notices that then excuse all reactors from solving a given issue...there are currently 1,000's of these in existence. (PNPS-D-A)

Response: *The comment is related to the ability of licensees to request exemptions of various NRC licensing requirements. 10 CFR Part 50.12, provides the NRC requirements on how licensees may obtain an exemption. The comment provides no new and significant information. Therefore, no changes have been made to the SEIS.*

Comment: I don't understand why the NRC doesn't require a license extension to be contingent on updating the plant to today's available technology instead of a patch work approach. (PNPS-D-Y)

Response: *It is assumed that this comment is in reference to the PNPS cooling system. NRC regulations require Entergy to comply with the Clean Water Act and the associated requirements imposed by USEPA Region I as part of their NPDES permit. However, NRC does not have delegated authority under the Clean Water Act to mandate mitigation measures associated with aquatic matters, specifically mitigation measures associated with PNPS's once-through cooling system. NRC, through development of the SEIS, analyzes the potential impacts of extending the plant's operating license. Therefore, making a license extension contingent on updating the plant to today's best technology available is outside the scope of the SEIS.*

A.2.2 Comments in Support of License Renewal at Pilgrim Nuclear Power Station

Comment: Mass AREA and its members fully support a license extension for the Pilgrim Nuclear Power Plan. On a typical day, Pilgrim provides seven to nine percent of the Commonwealth's electricity. Without it, Massachusetts and the region as a whole could face power supply shortages, including rolling blackouts, a lot sooner than predicted of next year.

Perhaps one of the most important issues that led Mass AREA to support a license extension for Pilgrim is the fact that the plant operates safely and continuously earns the NRC's highest safety rating of green. We also know that NRC staffers are on-site at the plant each and every day overseeing operations and helping to maintain a safe and secure environment.

The production and distribution of electricity, whatever the source, is inherently a challenging safety issues, yet nuclear power has proven safe. In 50 years of commercial operations, there has never been a radiological death at any U.S. nuclear plant. (PNPS-D-E, PNPS-D-P)

Comment: Opponents of the Pilgrim Power Plant often say we will be better off if the generator was decommissioned. However, the baseload power that would replace Pilgrim would most likely come from sources that are more expensive, far more polluting or both. At this time, wind and other renewable energy technologies simply can not generate the massive baseload power that would be needed were Pilgrim to cease operations. Moreover, the electricity that Pilgrim supplies is created without generating any greenhouse gas emissions and therefore it does not contribute to global warming.

Pilgrim also mitigates the production of hundreds of tons of sulfur dioxide and nitrogen oxides, chemicals which are harmful to human health, especially among children and the elderly, these health and environmental benefits alone are enough argument for renewing Pilgrim's license to produce power. (PNPS-D-E, PNPS-D-P)

Comment: In summary, Mass AREA has weighed all of the environmental, economic and energy supply traits of Pilgrim, particularly its long record of safety, and concluded that the Pilgrim Nuclear Power Plant is vital to the region, state and local economy for three reasons, its environmentally sound operations, its economic contribution to the local community through the provision of jobs and purchase of goods and services and its provision of reliable, low cost electricity. Mass AREA encourages the NRC to grant Entergy's Pilgrim station an extension of its license so that it can continue to safely operate for an additional 20 years. (PNPS-D-E, PNPS-D-P)

Comment: In addition, the critical role Pilgrim plays in supply and diversity, its role in producing electricity without air pollutants and laudatory, no pollution contributes to the state's goal of reducing greenhouse gas emissions. Achieving these goals will have some cost impacts on all consumers, but it's great to know that Pilgrim station provides economical electricity without a carbon footprint. Pilgrim also contributes to meeting and sustaining the electricity supply, as our demand grows on average of about two percent a year compounded. (PNPS-D-F)

Comment: With that as context, AIM believes that the draft environmental impact statement adequately complies with the requirements of the act, AIM urges the commission to adopt the recommendation of the report to continue consideration of relicensing. Given Pilgrim's positive contributions to the reliability, supply and cost of electricity in this state and its significant environmental benefit, we also would urge the commission to in fact relicense this plant. (PNPS-D-F)

Comment: I am here representing the South Shore Chamber of Commerce, which is an independent association of 2,000 businesses, including health care and educational institutions and nonprofit organizations in the communities from Boston to Plymouth, we are the largest chamber of commerce in Massachusetts. We are an association of business people who are committed to the economic health and the quality of life of the communities that we serve.

After evaluating the plant and its contributions to our region, its economic impact, the employment base, its environmental record, the addition, the very critical addition that it makes to a diverse and reliable energy supply and the plant's presence and overall contributions to the quality of life in our region, our leadership voted, after a health discussion, voted and voted unanimously to encourage the Nuclear Regulatory Commission to approve in a timely fashion the full relicensing of the nuclear power plant.

We are pleased to have this safe, secure, reliable source of power and its significant beneficial contributor to the employment base and to the overall economic well being as part of our region and we thank you very much. (PNPS-D-H)

Comment: I support Entergy's intention to apply for an extension of its NRC operating license beyond the current 2012 expiration date. My reasons are, one, this is hardly a new or dramatic change, it's the very same plant that's been operating quietly, safely and efficiently, largely out of view, having no massive cooling tower or towering smokestack, which some people want to change, for 33 years without major incident, the plant appears to be well managed and maintained and protected. (PNPS-D-L)

Comment: Three, it produces no discharge of carbon dioxide greenhouse gas, nitrous oxide orange plume like the oil-fired plant down on the canal, sulfur oxide precursors of acid rain or mercury emission to enter the seafood chain as from coal-fired plants. Radioactive discharge from vent stacks is negligible to nonexistent, as measured by on-site monitors meeting regulatory requirements. No shipment and unloading of heavy fuel, oil or LNG impacts our local area. (PNPS-D-L)

Comment: From a regional economic jobs and quality of life standpoint, we need both the electricity and the jobs that Pilgrim Nuclear plant provides. If we know that the plant is safe, which it is, if we know the workers are experienced and skilled, which they are, if we know these workers need these good jobs, which certainly they do, if we know the power is produced at low cost and is indispensable to our grid, which is true, if we know the contribution Pilgrim makes to the state's economy are immeasurable and irreplaceable, which they are --. I lost my fourth page. Then there are no reasons why the Pilgrim Nuclear Power Plant should be denied license renewal but rather a host of reasons why it should be allowed to continue being a key focal point of our energy and economic future. (PNPS-D-N)

Comment: In my opinion, this is a no-brainer, jobs are so important. We represent not only the workers at Pilgrim Power Station, we represent workers at fossil plants up in Cambridge, up in Everett, in South Boston, in Charlestown, in Weymouth and I could tell you the training that the people receive down at Pilgrim to run that plant is second to none, I have never seen anything like it. (PNPS-D-O)

Comment: So I just want to say, in closing, I think we have an obligation to our society and the fact that this power is needed on the grid. I think we have an obligation to the community that it serves and the fact that the people that work there thrive in the community. This plant exudes community involvement, I mean you cannot get a better example of how a business is helping a community. (PNPS-D-O)

Comment: I support relicensing of Plymouth station, nuclear power is the only viable long-term solution to our energy needs. It's cost effective, it's reliable, it's clean. Plymouth station is one of the largest local employers, it's one of the largest local industries, the majority of Plymouth station employees live in the county. In addition to protecting land, making sizable charitable donations to local nonprofits, Entergy and Entergy employees pay taxes, taxes and fees that go to the local operating budget, the local schools, the local police and fire.

Payroll at Entergy or payroll at the station is $55 million between permanent employees and contractors, that's $55 million injected into the local and surrounding economy, that's $55 million going into local shops, local restaurants and most important, our local housing market. Plymouth station is a valuable part of the local and surrounding community, I support the relicensing of Plymouth station. (PNPS-D-R)

Comment: I do look at it as, and I've listened to a number of people, Pilgrim has produced jobs, the people that work at Pilgrim are our neighbors, we have been living with them for 35 years, there has been no issues. We do have cost effective power, they live beside us, what's the problem? (PNPS-D-V)

Comment: The people who built Pilgrim have done a better job, for example, that the Russians. The people who maintain Pilgrim have done a better job than anywhere else, I think we have to recognize it. (PNPS-D-V)

Comment: I think we are dealing with obvious technological advancements, we are dealing with people who care about how the energy is produced, who live beside the plant, who live in our neighborhoods and I think we need to recognize that Pilgrim should be relicensed. (PNPS-D-V)

Comment: And as a resident of Plymouth, I know of no environmental problems that Pilgrim has created, according to what I've read from Mass DEP, the Federal EPA or the NRC. (PNPS-D-V)

Response: *These comments are noted. The comments are supportive of license renewal at PNPS, and are general in nature. The comments provide no new information. Therefore, no changes have been made to the SEIS.*

A.2.3 Comments in Opposition of License Renewal at Pilgrim Nuclear Power Station

Comment: I feel, in the long run, fission-based power is not the answer and I personally do not want to see nuclear power plants' lives extended any more than they have to be. (PNPS-D-C)

Comment: I've always been interested in Pilgrim, but common sense tells me it's time to start phasing out of this type of electrical source. (PNPS-D-C)

Comment: I hope you will thoughtfully consider the arguments I have presented and take the bold step of refusing to relicence the Pilgrim Nuclear Power Station. (PNPS-D-DD)

Comment: And so, by continuing to ignore the realities, what we are doing is depriving ourselves in the future of a cleaner, safer and cheaper source of energy for ourselves and for the generations down the pipe. (PNPS-D-Q)

Comment: Given the many unanswered or inadequately answered, inadequately answered concerns about the environmental and public health impacts of extending the life of this plant, we respectfully ask that the commission deny the relicensing of the nuclear power plant. We strongly believe that this plant does not deserve another 20 years of operation and the South Shore and the rest of Massachusetts definitely does not deserve another 20 years of the impacts from this plant. (PNPS-D-S)

Comment: I am against the re-licensing of Pilgrim in 2008. (PNPS-D-X)

Comment: Presently, and for decades, Pilgrim has been a dark shadow of legitimate concern in the region. Everyone knows in his/her heart that Pilgrim is the wrong energy choice for our future. (PNPS-D-X)

Comment: Members of the Nuclear Industry, certain non-profit organizations, members of certain universities long associated with DOE (MIT), and various departments and facilities associated with the government of the United States of America have in fact and deed through private meetings and quietly orchestrated work groups conspired to force funding into, and create a scenario whereby Nuclear is forced on America as the only workable option to resolve Global Warming, as it witnessed by the program Nuclear Power 2010/GNEP as will be proved by all the underlying documents that unveil the steps implemented over a period of over eight years by the afore mentioned individuals and groups to position nuclear as the favorite horse in a wrongful attempt to give nuclear energy a rebirth both here in America, and abroad. In short, we have an orchestrated RICO like attempt to not only prop up a failing industry, but to extort money from both rate payers, and the American tax payers with the help of every level of our

American Government up through and including President George Bush who was bought off with overly generous donations to his campaign war chest. (PNPS-D-A)

Comment: These comments are alleged specifically against not just the Pilgrim plant, and in opposition of the relicensing of this failing facility, but as much as possible are a condemnation of and a verified complaint against every nuclear reactor in America, a verified complaint against the nuclear industry, and further, and allegation against the Nuclear Regulatory Commission itself who has implemented a plan that places company profits ahead of human health and safety, as well as the being and protection of our environment. (PNPS-D-A)

Comment: The DOE, NRC, NEI, various assorted federal laboratories and George W. Bush, as well as key members of his staff have in fact and deed colluded with all key players within the nuclear power industry to artificially prop up, and renew a failing industry here in America and abroad in a wrongful attempt to extort money from both rate payers, and American Tax payers in direct violation of the RICO Act (Title 18, United States Code, Sections 1961-1968) and specifically, 1962(c). (PNPS-D-A)

Response: *The comments are noted. The comments oppose nuclear power in general as well as the license renewal at PNPS, but do not provide any new and significant information. Therefore, no changes have been made to the SEIS.*

Comment: Generically the Draft EIS is environmentally racist, fashioned in such a way as to mitigate and or eliminate from consideration in the license renewal process any and every element, of the Pilgrim Nuclear Reactor specifically, and all license renewals in generally, that negatively impacts the community (community and those within it are in fact and deed an environment unique unto itself, and occupied by members of the animal kingdom, specifically human beings) being forced to accept the ongoing operation of this unsafe, and fatally flawed reactor, and specifically attempts to ignore A) the environmental impacts associated with the physical degradation of the reactor and it's component parts, B) refuses to properly factor in the cumulative effects of the environmental degradation from continued operation of the plant past it's date of license expiration, and C) wrongfully tries to remove from the consideration process of re licensing serious safety and security issues at the plant that present very real and imminent dangers to both human health and the environment. Further, the reactor itself, and all reactors in the American fleet are no longer the reactors that were originally licensed by the NRC. (PNPS-D-A)

Comment: In general, the Pilgrim plant suffers from the same persistent problems of safety, security and storage as the nuclear industry in general. Even within the narrow scope of this review of the impacts of relicensure, there is ample evidence for denying the extension. Daily radiation releases, the vast amounts of radioactive waste stored on site at the plant, damaged

fisheries, and the risk of a terrorist attack are just some of the compelling reasons for letting the plant be decommissioned at the end of its planned lifespan - in 2012.

Given the many unanswered or inadequately answered questions about the environmental and public health impacts of extending the life of this plant, we respectfully ask that this commission approach the re-licensing of the Pilgrim nuclear plant with great caution and take into account the many concerns raised by the opponents of re-licensing. We are confident that, taking the entire picture into account, there will be ample grounds for denying relicensure. (PNPS-D-FF, PNPS-D-GG, PNPS-D-KK)

Comment: The three signatories strongly support the comments submitted by Pilgrim Watch. We concur that the draft Environmental Impact Statement ignores new and significant information and relies on incorrect assumptions about Nuclear Regulatory Commission (NRC) regulations as they relate to environmental and public health impacts. (PNPS-D-FF, PNPS-D-GG, PNPS-D-KK)

Comment: Please be advised that I support and concur with the comments submitted by Pilgrim Watch dated February 5, 2007, regarding the above captioned matter on the re-licensing of the Pilgrim Nuclear Power Facility. (PNPS-D-PP)

Comment: We strongly support the efforts and comments of Pilgrim Watch and the Office of the Attorney General of Massachusetts, among other groups opposed to relicensing of the Pilgrim Nuclear Power Plant.

We concur with conclusions that the draft environmental impact statement ignores new and significant information and relies on incorrect assumptions about NRC regulations, as they relate to environmental and public health impacts. The Pilgrim plant suffers from the same persistent problems of safety, security and storage as the nuclear industry in general.

Even within the narrow scope of this review of the impacts of relicensure, there are significant impacts that should be grounds for denying the extension. Daily radiation releases, the vast amounts of radioactive waste stored indefinitely on-site at the plant, damaged fisheries and the risk of a terrorist attack are just some of the compelling reasons for letting the plant be decommissioned at the end of its planned life span in 2012. (PNPS-D-S)

Response: *These comments are noted. The comments oppose nuclear power in general as well as license renewal at PNPS, but do not provide any new information. Therefore, no changes have been made to the SEIS.*

A.2.4 Comments Concerning Surface-Water Quality, Hydrology, Groundwater and Uses Issues

Comment: Testing Silver Lake - it provides drinking water to Brockton. There is no indication that the lake has been tested for radionuclides; and Brockton adds an environmental justice dimension, due to its economic profile. (PNPS-D-EE)

Comment: I do want to point out that at the ten mile limit is Silver Lake which supplies ten million gallons a day to the Brockton water supply system in the City of Brockton, which is a social justice community, and I do not believe there has been monitoring of Silver Lake, although I could be wrong, regarding emissions and those kinds of long-term impacts. (PNPS-D-I)

Comment: JRWA briefly reviewed other aspects of the report, including 2.2.8.2 Public Services. The "Selected Plymouth County Public Water Supply Systems and Capacities in 2003" ignores the largest water supply in the county, the surface water reservoir at Silver Lake. Silver Lake is 640 acres, and is just beyond the 10 mile EPZ in the towns of Kingston, Pembroke, Plympton and Halifax. It is the primary water supply for nearly 100,000 users in Brockton and Whitman. At this time an average of about 10 million gallons a day are piped to those communities. Brockton qualifies as a social justice community. Silver Lake should be regularly monitored for radiological pollution. (PNPS-D-NN)

Comment: USGS performed water quality analysis of regional drinking water wells in 2005 in response to an EPA general program. The presence of Strontium was included in the analysis, and results were provided by weight-without discussion of radioactivity. The highest levels of Strontium in the region were found in the Kingston Millgate well. Discussion with USGS confirmed that the level was high, and that no lab notes provided a further description regarding any analysis for radioactive Strontium-90. JRWA believes that off-site sampling of groundwater should be included to assess impacts from past and present radioactive venting of gases at Pilgrim. Radiological monitoring does not include this human and environmental exposure pathway. Ingestion of Strontium-90 is tolerated at MUCH lower doses than airborne exposure. (PNPS-D-NN)

Comment: JRWA believes that off -site sampling of regional groundwater should be included to assess impacts from past and present radioactive venting of gases at Pilgrim. Radiological monitoring does not include this type of sampling and the exposure pathway to residents of the area is direct. Dangerous levels of dosing are entirely possible, and have the potential to be long lasting. In the USGS testing, only a few representative wells were sampled and analyzed. (PNPS-D-NN)

Comment: The Millgate well is supplied by groundwater which, if not used in drinking water distribution, will ultimately flow to the Jones River. Groundwater in areas of Plymouth flows to Cape Cod Bay. JRWA requests that PILGRIM and NRC test for the presence of Strontium-90 in regional groundwater. (PNPS-D-NN)

Response: *During the environmental review, the NRC evaluated the existing radiological monitoring program and other sampling data for PNPS. The Radiological Environmental Monitoring Program (REMP), defined in the Offsite Dose Calculation Manual (ODCM), includes direct radiological monitoring, as well as, radiological analysis of air emissions, surface water, and terrestrial and aquatic biota. The locations of these samples have been selected to evaluate potential impacts in a wide area, in all directions from the plant, including the area referenced by the commenters. Radiological analyses of these samples have not detected any radionuclides that could be attributed to facility operations, or that could have resulted from airborne emissions.*

Although the REMP does not include sampling of groundwater, sampling and radiological analysis of three groundwater wells near PNPS was performed for a different purpose in 1999. These samples did not identify any radionuclides that could have been due to direct releases from the facility, or from airborne emissions.

Based on the lack of facility-related radionuclides, including Strontium-90, in the groundwater samples close to PNPS, or in the surface water and air emissions samples located northwest of the facility, NRC concludes that it is unlikely that groundwater or surface water resources in this northwest area have been affected, and therefore, impacts during the relicensing period are unlikely.

Currently, the ODCM does not require groundwater monitoring, specifically because groundwater at the site discharges directly to Cape Cod Bay. In addition, the ODCM does not require sampling of Silver Lake, because it requires sampling of surface water bodies that are closer to the facility and, therefore, more likely to be impacted. Nonetheless, the ODCM does require that NRC review the sampling locations annually and modify them as necessary. These comments are noted, but provide no new and significant information. Therefore, no changes have been made to the SEIS.

Comment: Page 2-10, Line 38 - Based on the PNPS NPDES Permit and Table 2-2 of the PNPS DSEIS, there are no temperature limitations on the service water. Therefore, the sentence "The permitted change in temperature across the service water is 5 to 10°F." is incorrect and should be deleted. (PNPS-D-MM)

Response: *The text in Section 2.1.3. has been modified in response to this comment.*

Comment: Page 2-23, Line 33 - The sentence "Notes: For the majority of outfalls, the pH shall not be greater than or less than 0.5 standard units of the influent." is inaccurate. Only four outfalls have the "0.5" limit while one outfall has no pH limit, and five outfalls have pH values that range from 6.0 to 8.5. Therefore, the majority of the outfalls do not have the "0.5" value. (PNPS-D-MM)

Response: *The note associated with the table was modified accordingly.*

A.2.5 Comments Concerning Aquatic Ecology, Terrestrial Ecology, General Ecology, and Threatened and Endangered Species Issues

Comment: Cape Cod Bay is an ocean sanctuary under Massachusetts state law, that wasn't mentioned in the report. It is a violation of state law that anything effect a habitat and I think that would mean that the fish species considerations has to be broadened and it certainly has to include such species as shad and a the American Eel, and perhaps even the Sand Tiger Shark which again wasn't mentioned in the report but is not only becoming more of a species of special concern, it also is becoming more frequent in our waters or it appears to be so. (PNPS-D-I)

Response: *Chapter 123A, Section 16, of the General Laws of Massachusetts notes that operation and maintenance of existing municipal, commercial, or industrial facilities and discharges that are approved and licensed by appropriate federal and state agencies are permitted activities in ocean sanctuaries. Although the proposed action may affect the habitat; as long as the action is permitted by the Commonwealth, it is allowable under state law. Additional text will be added to Section 2.2.5.3 noting that Cape Cod Bay has been designated as an Ocean Sanctuary by the Commonwealth of Massachusetts. However, this does not affect the list of important and rare marine species, identified in this section, that warrant evaluation in the SEIS.*

Comment: Page 4-22 - Figure 4-1 does not represent "the loss of adults from the local stock," it is the "numbers of equivalent adult winter flounder estimated from entrainment and impingement data at PNPS." It should be made clear that the equivalent adult method yields a hypothetical estimate not an actual measurement. (PNPS-D-MM)

Response: *The comment is noted and the edits suggested by the commenter have been incorporated into the text that describes Figure 4-1.*

Comment: We are starting to see a lot less native species and a lot more altered species and this is not good for use in the long run, we are also seeing entrained in the system the American Lobster, this is a commercial fishery also and that deserves more attention, I believe, than in the report. (PNPS-D-I)

Response: *The NRC staff has not identified a decline in species diversity or abundance in Cape Cod Bay due to operation of PNPS. The American lobster was discussed as an important benthic invertebrate species in Section 2.2.5.3.4, and entrainment, impingement, and thermal effects on the lobster were evaluated in Section 4.1. The comment provides no new and significant information; therefore, no changes have been made to the SEIS.*

Comment: Page 4-15, Line 14, 19-20, and 21 - Regarding " ... significant events .. ," and ".,.high entrainment events can contribute a significant percentage of the overall annual entrainment numbers for certain species. " This statement(s) is misleading because - although its obvious that high ichthyoplankton densities in close proximity to the CWIS are expected to increase the annual entrainment numbers - it has not been determined that these are "events," or that they are anything more than natural fluctuations, when compared with the long-term data set. Use of the word "significant" is improper because it is in quotes yet it is not used at all in the pertinent section of the referenced Annual Report, and it is not statistically appropriate. This statement is not a basis for determining a trend or establishing that an impact exists, so its relevance is unclear. (PNPS-D-MM)

Response: *Section 4.1.1.2 has been edited to note that these events are exceptionally high (as stated in the PNPS NPDES permit) as opposed to significant.*

Comment: I also have questions regarding some terminology. On page 47 of the PNPS Supplement 29 Draft it states: "The service water system is continuously chlorinated in order to control nuisance biological organisms in the service water discharge." I think it is vitally important to define here what a "nuisance biological organism" is and also regard definitively how this organism operates solely inside the confines of the PNPS ecosystem. This unidentified organism could play a vital part in the survival of this particular diverse marine ecosystem. (PNPS-D-LL)

Response: *The nuisance biological organisms referred to are biofouling organisms (such as mollusks, barnacles and other invertebrates, algae, and bacteria) that attach themselves to facility surfaces exposed to water. Biocides such as chlorine are used to control their growth within the facility, but discharges of biocides outside of power plants have been found not to have significant impacts. The discharge of chlorine and other biocides has been determined to be a Categoty 1 issue for license renewal for all nuclear plants. Section 2.1.3 has been modified in response to this comment.*

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Comment: Essential Fish Habitat was evaluated for many species. JRWA is concerned that the staff conclusion is not substantiated and should be reconsidered. The staff concludes [E-105] that "Continued operation of the PNPS cooling water system was determined to have a minimal adverse effect on EFH for 17 species, a less than substantial adverse effect on EFH for 8 species, and a substantial adverse effect on EFH for 7 species".... (emphasis added) And goes on to conclude: "Within the overall Cape Cod Bay ecosystem, ...continued operation of the PNPS cooling water system would have a minimal adverse effect on EFH."

We believe this is a wholly unsubstantiated conclusion because the staff has not evaluated the cumulative impact of fish loss to the general fishery. In our view, because Rainbow smelt, Alewife, Atlantic menhaden, Atlantic mackerel, Atlantic silverside, Blueback herring and winter flounder are important prey for Striped bass and Atlantic cod (as examples), the loss of sufficient populations of these smaller fish will ultimately impact on the population of the more valued Striped bass and cod-and therefore is a matter of great concern, that should not be dismissed. Many of the fish suffering large losses are now highlighted for dangerously low population levels (river herring, smelt, and menhaden) in the region although no NMFS management plan yet exists. (PNPS-D-NN)

Response: *The commenter notes the potential for cumulative impacts associated with operation of the PNPS cooling water system as a result, in particular, of reduced prey populations. The EFH Assessment considered impacts to prey of EFH species as one of the metrics used in determining the degree of impact to EFH. The NRC staff also evaluated the potential for cumulative impacts in Section 4.8.1 of the DSEIS. The comment provides no new or significant information; therefore, no changes have been made to the SEIS.*

Comment: In the same way that there is concern for the EFH for fisheries determined by NOAA to require Management Plans pursuits to the Magnuson-Stevens Act, so too should there be concern for the habitats essential to fish species that are experiencing precipitous population decline such as the Rainbow smelt, Alewife and Blueback herring, among others--the cumulative impact resulting from the plant impingement and entrainment on water quality, temperature and population abundance on these fish, and thus on long term survivability, was not adequately examined. (PNPS-D-NN)

Response: *As described in Section 2.2.5.3.1, the SEIS identified a group of important fish species for evaluation as representatives of the potentially affected fish community in Cape Cod Bay. These included species that are commercially or recreationally valuable, species critical to the ecosystem, and species for which essential fish habitat (EFH) has been designated in the vicinity. The rainbow smelt was among the important species evaluated throughout Section 4.1 but does not have designated EFH. The blueback herring and alewife are very similar and are often referred to collectively as "river herring." Neither species was determined to have EFH in the vicinity of PNPS, but both are commonly impinged at PNPS, with greater numbers of*

alewife being affected. Although only the alewife was chosen as one of the important species for evaluation, it provides a conservative representation of potential impacts on the blueback herring due to their similar life histories and habitats. Due to limitations associated with each method of assessing fish populations and the significance of impacts, multiple methods were considered as lines of evidence in arriving at conclusions based on the weight of the available evidence. The basis for the conclusions regarding the species evaluated are described in Sections 4.1.1 and 4.1.2. The level of significance of impacts was assessed based on the three-level system (small, moderate, or large) developed by NRC and in accordance with the Council on Environmental Quality's regulations (40 CFR 1508.27) requiring the assessment to consider the context and intensity of the impact. Cumulative impacts from multiple factors were considered in the assessment and discussed in Section 4.8. The comment provides no new and significant information. However, this new issue of aquatic habitat (other than designated EFH) has been added to the SEIS and is discussed in Section 4.7.

Comment: Blueback herring spawn in the Jones River during the same general period as the alewife, preferring slightly colder and moving water. The spawning migration begins about in April for river herring and extends into June. The run seems to include fish of all age classes so it is difficult to determine without additional study at what the age the fish are spawning. Blueback herring have different habitat requirements, at least in the river, yet they were not discussed in the SEIS. However, Marine Ecology Studies Related to the Operation of Pilgrim Station; Annual Report #61 for the year 2002, show that blueback herring were the dominate species impinged in November that year and fifth in rank for the year (Table 5). Yet this species is not evaluated in the SEIS. (PNPS-D-NN)

Response: *As described in Section 2.2.5.3.1, the SEIS identified a group of important fish species for evaluation as representatives of the potentially affected fish community in Cape Code Bay. These included species that are commercially or recreationally valuable, species critical to the ecosystem, and species for which essential fish habitat (EFH) has been designated in the vicinity. The blueback herring and alewife are very similar and are often referred to collectively as "river herring." Neither species was determined to have EFH in the vicinity of PNPS, and both are commonly impinged at PNPS, with greater numbers of alewife being affected. Although blueback herring have different habitat requirements in the river, the habitat in the immediate vicinity of PNPS, which is marine, is the same as for the alewife. Although only the alewife was chosen as one of the important species for evaluation, it provides a conservative representation of potential impacts on the blueback herring. The comment provides no new and significant information; therefore, no changes have been made to the SEIS in response to this comment.*

Comment: That PNPS is supporting hatchery release of winter flounder, is not itself sufficient to address all the impacts to fish and aquatic organisms. In fact, hatchery fish may not even be good mitigation for winter flounder, as over time the genetic pool of the species may become so

narrow as to threaten the ability of the Cape Cod Bay flounder to adapt, or overcome adversity. A hatchery mitigation and release plan cannot become a license to kill flounder, nor can a program for growing winter flounder for release into the wild address the impacts to the other species of fish, such as Rainbow smelt, Alewife, Blueback herring and Atlantic mackerel or menhaden. It should be required that PNPS assist these populations of concern by correcting its flawed intake structure and assist in habitat restoration activities in the region. (PNPS-D-NN)

Response: *NRC's regulations require the staff to analyze potential impacts of renewing the plant's operating license and of alternatives to license renewal. Section 4.1.4 provides an overview of potential mitigation measures to minimize adverse impacts to marine aquatic resources. Therefore, a detailed evaluation of the potential feasibility of each of these measures was not conducted. Requiring modifications to the intake structure and/or requiring habitat restoration activities are beyond NRC's regulatory authority but would be within EPA's authority under the Clean Water Act. This comment provides no new and significant information; therefore, no changes have been made to the SEIS.*

Comment: The DSEIS at page 4-38 indicates that NRC staff have not found that the pilot flounder stocking "has substantially offset impacts from continued operation of PNPS to the local winter flounder population." The DSEIS also does not provide any new information or evidence to suggest that hatchery fish can persist in the environment and recruit to the adult population. Thus, the DSEIS appears to lack support for the assertion that if the current winter flounder stocking program is expanded, that it "may have a beneficial impact" on the local population (DSEIS page 4-38). If the continuance or expansion of the stocking program remains a reasonably foreseeable option for Pilgrim Station, we recommend that the FSEIS more fully explore whether stocked fish survive to reproduce and the potential impacts of hatchery-reared fish on the native population. (PNPS-D-OO)

Comment: Winter Flounder, as previous speakers have talked about, have been deemed a moderate, I think I have the right terminology, a moderate impact instead of a small impact, meaning that there has been some mortality associated with Pilgrim's activities.

So about eight years ago people from Pilgrim and myself had worked on how to possibly make that a small impact, meaning how do you deal with this problem of killing Winter Flounder or impinging Winter Flounder? Basically, since eight years ago, we've been taking adult Winter Flounder that are natural wild stocks and spawning them. And in that process, we've basically reproduced 33 millimeter hatchery fish, which would be the same as a wild fish, and placed it out into our harbors very close to us right now, and done studies to see how they survive and if it is possible to replenish the stocks by use of hatcheries for mitigation.

And over the past eight years, we have compiled a whole bunch of data, nothing seems to be negative, everything seems to be showing that, at a larger scale, you could make this problem

mitigated by the use of hatcheries, making it a small impact that Entergy has or even a no impact with Winter Flounder, I know nothing about the other ones. Basically, I can support that idea with the idea that aquaculture of hatcheries have been used for decades with replacing fish stocks, this has, we have seen this work with shellfish in Massachusetts and all kinds of other fisheries around the world.

The potential benefit to this being used as a mitigation tool would be to the community, giving jobs to the hatchery and also giving more fish for the fishermen to catch. In conclusion, I basically believe that Pilgrim could have no impact on the Winter Flounder population, in my mind, by use of hatcheries and that the benefits could really be to the communities, to the fishermen and also for jobs. I think that if we, if the number of hatchery released fish was increased, that they wouldn't have a problem to augment any potential problem associated with Winter Flounder. (PNPS-D-J)

Response: *NRC staff reviewed the results of the winter flounder hatchery pilot program. Data contained within these results were not sufficient to determine whether a larger-scale hatchery program would benefit the local winter flounder population or the community. Requiring habitat restoration activities is beyond the NRC's regulatory authority but would fall under the EPA's authority under the Clean Water Act. This comment provides no new and significant information; therefore, no changes have been made to the SEIS.*

Comment: There appear to be many methods used to determine impact, each with drawbacks. It must be determined before going forward with the re-licensing process what methods provide the most reliable estimates of impact, with a detailed rationale; a requirement that these methods are followed by the licensee unless better methods are established and independently approved.

We understand that there has been no policy statement regarding losses on a square mile basis by any state or federal agency. NRC should in its review process determine what percent loss is a significant detriment to any population [figure depending on population], with a detailed rationale.

Entrainment: Winter Flounder - methods used by Entergy to determine impact

1. Equivalent adult method: "researchers conducting this work have assumed an otter trawl efficiency of 50%, but the actual efficiency may be much lower (or higher), which would alter the number of fish in the study area per square mile and the apparent impact. Second, entrainment sampling results are quite variable. Third, it is difficult to determine the accuracy, and therefore, the applicability, of the survival matrix used in estimating equivalent adults."

Whether or not these levels of impact are a "significant" detriment to the population, and will result in slowing the return to much higher population densities, is currently unknown and a policy statement regarding losses on a square mile basis has not been issued by any of the state or federal agencies. EPA Region I has stated in the past that population impacts of 5% or greater are typically of concern. However, to DEP's and Pilgrim Watch's knowledge, the geographic bounds of this particular population have not been agreed upon by state or federal agencies.

2. 2nd method - estimate the percentage of the total larval population passing in front of the facility that is entrained.

3. The third method used by the facility to evaluate impact was the RAMAS (Risk Analysis Management Alternative System; Ferson, 1993) winter flounder model. It was used from 1999-2001 to further evaluate the effects of the facility on the Cape Cod Bay winter flounder population. Results suggested that stock reductions from 2.3 to 5.2% might occur as the direct result of entrainment at the facility.

It should be determined and agreed upon by NRC, appropriate state agencies and independent analysts what method or methods actually provide accurate information needed to assess more accurately impact before the license is approved.

4. An analysis of Backwash effects has not been performed to the best of our knowledge.

4.1.4 Potential Mitigation Measures: 12 measures are listed; however "The NRC staff has not conducted an analysis of each of these measures relative to their applicability to PNPS... It is expected that a more thorough analysis of the costs and benefits of these technologies would be conducted as part of the 316(b) CDS currently being conducted by PNPS in support of the NPDES permit renewal.

" Missing from the list is thermal discharge - allowable maximum temperature of the water discharged and its measurement. Discharge temperature is now averaged over an hour; instantaneous measurement should be required. We are told that instantaneous releases have been over the allowable limit. Those reading do not appear on the record because they can be countered by a lower release - a way to cook the books and the fish that happen to be swimming by at the wrong time.

5. Cape Cod Bay is an Ocean Sanctuary. Therefore greater consideration of a wider range of species needs to be analyzed further. (PNPS-D-EE)

Comment: The staff concludes that cumulative impacts of PNPS license renewal would be SMALL for most potentially affected resources, with the exception of the local winter flounder population and Jones River population of rainbow smelt, for which impacts would be MODERATE (p.9-5).

Methods used to Assess Impact: How did NRC come to their conclusion when marine impact can not be assessed at present because definite numbers have not been set on what constitutes "significant impact." A yardstick has to be firmly established for each species (plant and animal) with appropriate federal, state and independent partners and rationales provided to the public; and Thermal backwash as not considered. During a thermal backwash, about 155,000 gpm of heated water (>105°F) is sent into the intake embayment for a period of about 1.5-2 hrs. Studies to evaluate potential impacts of the thermal backwash have not been performed. (PNPS-D-EE)

Response: *The issues raised in these comments include (1) methods for determining impact to the winter flounder population, (2) analysis of thermal effects, (3) designation of Cape Cod Bay as an Ocean Sanctuary, and (4) classification of impacts.*

Regarding (1), NRC staff met with representatives of State and Federal agencies prior to development of the SEIS to discuss methods of evaluating impacts on marine populations. Due to limitations associated with each method of assessing winter flounder populations and impacts, multiple methods can be used to evaluate status and trends of these populations. Multiple methods were therefore considered as lines of evidence in arriving at conclusions stated in Section 4.1 of the SEIS.

Regarding (2), thermal backwashing operations and their effects are described in Section 4.1.3. The analysis of thermal impacts was based on measured temperatures within the bay itself, the extent of the plume throughout the tidal cycle, and minimal effects documented by the biological monitoring programs in the affected area. USEPA Region I administers the NPDES permitting process in Massachusetts, and the NRC does not have authority over matters concerning discharge permits and measurement methods for temperature or other discharge parameters.

Regarding (3), Chapter 132A, Section 16 of the General Laws of Massachusetts notes that operation and maintenance of existing municipal, commercial, or industrial facilities and discharges that are approved and licensed by appropriate Federal and State agencies are permitted activities in ocean sanctuaries. Although the proposed action may affect the habitat, as long as the action is permitted by the Commonwealth or EPA, it is allowable under state law. Additional text has been added to Section 2.2.5.1 noting that Cape Cod Bay has been designated as an Ocean Sanctuary by the Commonwealth of Massachusetts. The three criteria

used to determine the important fish species analyzed in the SEIS were commercially or recreationally importance; species for which EFH has been designated, and species that are considered to be critical to the local ecosystem.

Regarding (4), the level of significance of impacts was assessed based on the three-level system (small, moderate, or large) developed by NRC and in accordance with the Council on Environmental Quality's regulations (40 CFR 1508.27) requiring the assessment to consider the context and intensity of the impact.

Aside from the additional text added to Section 2.2.5.1, no other changes have been made to the SEIS in response to these comments.

Comment: JRWA believes that there is sufficient evidence provided through the [2004-2006] DMF study on rainbow smelt to conclude that the population of smelt is significantly reduced and therefore continued impingement at equivalent rates under an extended license as evidenced over the past thirty years at the plant will have a SIGNIFICANT impact on this species. (PNPS-D-NN)

Comment: In 2004 the National Marine Fisheries Service (NOAA) listed *Osmerus mordax* as a Species of Concern Designation. The fishery is closed by regulation from March 15th to June 15th to protect spawning fish. The PNPS has consistently impinged adult fish and entrained eggs and larvae. Impinged fish have low survivability, and has occurred every year with some dominant years. NMFS apparently does not yet have an assessment of the impact of PNPS on the population of rainbow smelt.

JRWA is very concerned about the decline in smelt population in the Jones River. Formerly the Jones sponsored the largest smelt run in Massachusetts, [DMF Report 1928], and now it is a mere shadow of that past. Significant impingement events have periodically occurred at PNPS and can be directly associated as a cause of the decline in the Jones. The essential habitat for this population of rainbow smelt is very likely Cape Cod Bay, with PNPS as the largest negative influence. Smelt generally live less than 1 mile from shore and in water less than 19 ft. deep. Given that an estimated 76% of the species is preyed upon annually by other fish and birds (NOAA.gov information sheet), loss of this food source could have a significant impact on other species. While the SEIS and staff report a potential MODERATE cumulative impact on the smelt, there is no reasonable discussion that this impact would have on a broader range of species.

JRWA is of the opinion that the present low population numbers of rainbow smelt, the designation of Special Concern by NMFS, and the ongoing impingement of adults as well as entrainment of eggs and larvae, including occasional dominant species impingement events at PNPS, is sufficient reason for NRC to determine that continued operation of the once through

cooling as now configured will have a SIGNIFICANT and potentially catastrophic impact on the remaining population - and that this impact is NOT acceptable. (PNPS-D-NN)

Response: *The NRC staff determined in the DSEIS that there would be a moderate impact to the Jones River population of rainbow smelt from re-licensing of the plant. The basis for this determination is: 1) the high impingement rate of rainbow smelt at PNPS, 2) the low survivability of impinged rainbow smelt at PNPS, 3) proximity of the Jones River to PNPS, 4) the unknown status of the Jones River population, and 5) the uncertainty regarding the spawning run origins of rainbow smelt impinged at PNPS. Based on the data available, NRC acknowledges that continued operation of PNPS does have an impact on the Jones River population of rainbow smelt and may be contributing to the declines observed in the Jones River population. However, there may also be other factors such as habitat low which are contributing to population declines. Due to the lack of data on population status, there is much uncertainty regarding the potential impacts of continued operation of PNPS. However, based on the available data, NRC staff does not have any information that indicates that continued operation of PNPS would have a "potentially catastrophic impact on the remaining population," and thus, the moderate determination stands. The loss of rainbow smelt as a food source for other organisms is addressed in the cumulative impact section (Section 4.8.1). Sections 4.1.2.2 and 4.8.1 have been revised in response to these comments.*

Comment: If the chlorination and hypochlorination occurs around the time when fish are spawning to produce offspring, (Spring, Summer, Fall), and this time period lasts for 2 hours per day, with time through the plant of 5-10 minutes, then the amount of liquid chlorination effecting the fish population in Cape Cod Bay could be greater than what studies have shown. No study is definite and there is no data present in the report regarding the effect (long or short term) of chlorination to the marine aquatic ecosystem. This, I feel, is an important consideration evaluation of PNPS and it's relationship to the marine aquatic ecosystem. There should be further data collected and reported as to how much chlorination and chlorine is discharged into Cape Cod Bay. (PNPS-D-LL)

Comment: The DSEIS (DSEIS page 4-35) lists an automated chlorine monitoring and warning system for the service water and/or condenser cooling water systems as a means to possibly mitigate for a portion of the potential impacts of the continued operation of Pilgrim Station. EPA recommends that improvements to the screenwash system be included in this discussion because chlorine exceedences occurred when there were problems with the screenwash dechlorination system. EPA also recommends that the FSEIS include an evaluation of the potential for reduced impacts associated with the installation of an automated chlorine monitoring system that includes a malfunction notification component. (PNPS-D-OO)

Response: *As discussed in Section 2.2.3.1, Entergy is required to monitor chlorine levels (measured as total residual oxidants) in its cooling water and service water discharges as a*

condition of its NPDES permit. As discussed in Section 4.1, discharge of chlorine or other biocides is a Category 1 issue determined in the GEIS to have small impacts. The NRC staff reviewed recent discharge data (2005-2006) and determined that the two exceedances of chlorine permit limits during this period occurred when one of the dechlorination pumps was not pumping adequately. Improvement to the screenwash dechlorination system, such as an automated chlorine monitoring system, is briefly discussed as a potential mitigation measure though its potential to further reduce impacts would be limited due to the minimal impacts associated with the current system. The intent of the mitigation measures section (Section 4.1.4) is to provide a general overview of the potential measures that may be applicable to PNPS. Thus, a detailed discussion of the effectiveness of installing an automated chlorine monitoring system that includes a malfunction notification component is outside the scope of this analysis. The staff concluded that "there would be no significant impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS." This comment provides no new and significant information; therefore, no changes have been made to the SEIS.

Comment: EPA does not believe that the cooling water bypass flow mitigation measure discussed in the DSEIS (DSEIS page 4-37) should be presented as a measure to mitigate for impingement and entrainment impacts since the intake flow at the CWIS remains unchanged. (PNPS-D-OO)

Response: *The intent of the mitigation measures section (Section 4.1.4 of the DSEIS) was to provide a general overview of the potential mitigation measures that may be applicable to PNPS. The option of a cooling water bypass flow was previously presented in the PNPS 316(b) study (ENSR 2000). As stated in the DSEIS, the cooling water bypass flow mitigation measure is not likely to reduce impingement but entrainment effects may be reduced because fewer organisms would pass through the condensers. Section 4.1.4 has been revised in response to this comment; however, the NRC staff still considers the cooling water bypass flow as a potential mitigation measure.*

Comment: I'm concerned about the method of approach in monitoring, I would like to talk to Earth Tech a little bit more about this, but I understand that a lot of the monitoring happens post sweeping of the screens and I think there is probably an impingement and an entrainment factor that happens when we are not looking and that there needs to be --. I at least need more understanding of that and a complete listing of the 77 species that are impinged and the 66 species that are entrained so that I can help evaluate what these impacts are going to be. (PNPS-D-I)

Response: *Monitoring requirements are defined in the NPDES permit, which is issued by USEPA Region I. The NRC has no regulatory authority regarding the conditions set in the NPDES permit. A table has been added to Section 4.1 of the SEIS that lists the species that*

have been entrained and or impinged at PNPS during its operating history. Based on the information reviewed by NRC staff, 73 different species have been impinged over the operating history of the plant, while 63 different species have been entrained.

Comment: The DSEIS (DSEIS page 4-25) indicates that a reimpingement study during the 80's was never completed. Also, the DSEIS (DSEIS page 4-37) lists moving the fish return sluiceway discharge point as a mitigation measure to avoid reimpingement. We recommend that this section of the FSEIS be expanded to include a discussion of the effectiveness of physical and operational modifications to the fish return system including more frequent or continual screen rotation. (PNPS-D-OO)

Comment: Mitigating aquatic population loss is different from requiring mitigation of water quality impacts, which the NRC staff state is beyond its jurisdiction to regulate. However, direct kill rate of species is distinct from water quality degradation that impairs habitat and as a result, affects fish. Here we must address the systematic damage to species that, over time, results in a loss in the environment that could significantly impair the ability of other species to survive-and thus NRC should require mitigation. At this time we know that Rainbow smelt, river herring, Atlantic mackerel, winter flounder, Atlantic cod and other fish impacted by the plant are troubled by declining numbers, while some, like the cod, have FMP, others are listed as Special Concern. Impacts of the Pilgrim plant upon these species should be avoided, and if they are not, those impacts must be mitigated so as to not lose important fish populations. (PNPS-D-NN)

Comment: EPA's scoping comments noted that the majority of rainbow smelt impinged at Pilgrim Station are believed to have originated from the nearby Jones River population and that without quantification of the size of that population it is not possible to fully assess the relative impact of Pilgrim Station's operations on rainbow smelt. The DSEIS (DSEIS page 4-27) indicates that "considerable uncertainty exists regarding potential impacts to rainbow smelt populations." The DSEIS discusses mitigation measures that could be implemented to reduce impingement event impacts at Pilgrim Station (DSEIS page 4-36) with what appears to be limited analysis of whether they would be effective and to what degree they could be expected to reduce impacts. EPA recommends that the FSEIS expand on that analysis. (PNPS-D-OO)

Comment: EPA agrees with the final conclusion in Section 4.1.2.3 of the DSEIS that the "continued operation of PNPS would have a MODERATE impact on the Jones River population of rainbow smelt due to impingement over the course of the license renewal term" and "SMALL to MODERATE impacts on other marine aquatic resources due to impingement." EPA recommends that the FSEIS evaluate further mitigation options for these impingement impacts. (PNPS-D-OO)

Comment: Given the staff conclusion that plant operations are likely to have Significant impacts on the EFH for American plaice, Atlantic cod, Atlantic mackerel, red hake, whiting, windowpane flounder, and winter flounder, and given the tenuous sustainability of many of these species, PNPS should not be re-licensed without significant upgrades to its cooling system and substantial mitigation efforts to help restore areas, such as salt marshes and spawning habitats in the Cape Cod Bay region that can help boost survivability of PNPS affected species. (PNPS-D-NN)

Comment: I hope as stated in the PNPS Supplement 29 discussion of potential mitigating measures does more than "only provide a brief overview of technologies." These technologies provide solutions to the problems regarding the continued use of PNPS as a power source and should be thoughtfully considered. (PNPS-D-LL)

Comment: The evaluation of alternative mitigation measures and cooling water intake structure technologies in the DSEIS (DSEIS pages 4-34 through 4-38) is limited to a listing of various measures. We recommend that this analysis evaluate the benefits of such systems as well as their engineering feasibility and associated adverse impacts, if any. (PNPS-D-OO)

Comment: Based on the information presented, and given the three tiered NRC classification system (i.e., Small, Moderate, Large), we agree with NRC's conclusion in Section 4.1,1.4 of the DSEIS, Summary of Entrainment Impacts, that the "continued operation of the PNPS would have a MODERATE impact on the local winter flounder population due to entrainment over the course of the license renewal term" and "a SMALL to MODERATE impact on the overall Gulf of Maine winter flounder stock as well as on all other marine aquatic resources due to entrainment." These conclusions about the level of impact appear justified by the entrainment data collected to date. We recommend that the FSEIS include a more comprehensive evaluation of the effectiveness and engineering feasibility of measures to mitigate this entrainment impact, including retrofitting the once-through cooling water system with closed-cycle cooling technology. (PNPS-D-OO)

Response: *Section 4.1.4. provides an overview of potential mitigation measures to minimize adverse impacts to marine resources. Therefore, a detailed evaluation of the potential feasibility of each of these measures including mitigating aquatic population loss, to address impacts associated with PNPS's cooling system was not conducted and is considered to be beyond NRC's regulatory authority but would fall within EPA's authority under the CWA. In the SEIS, the NRC did consider the direct kill rate of species when evaluating the impact on aquatic species. These comments provide no new and significant information; therefore, no changes have been made to the SEIS in response to these comments.*

Comment: Page xxi, Lines 17-18 - The sentence "Additional mitigation to minimize the impacts of entrainment and impingement may be justified." should be deleted. In addition to mitigation

already being addressed in the last sentence of this paragraph, with the EPA recognized as the regulating authority, the NRC is not known to have been delegated authority under the Clean Water Act to make recommendations regarding mitigation measures associated with "aquatic matters". (PNPS-D-MM)

Response: *NRC recognizes that it does not have delegated authority under the Clean Water Act to mandate mitigation measures associated with "aquatic matters" and that USEPA, Region I is currently evaluating Entergy's NPDES permit renewal application for PNPS. The NRC's responsibilities during the environmental review of license renewal are to determine and document the environmental effects of operating a nuclear power plant for an additional 20 years, as outlined in 10 CFR Parts 52 and 54. The text referred to in the comment is a conclusion drawn from the technical review of the available information during the environmental review. The text was not intended to serve as a recommendation or a mandate regarding mitigation measures; therefore, no changes have been made to the SEIS.*

Comment: In addition, I believe that our marine aquatic resources are being compromised by the intake design of the PNPS. (PNPS-D-DD)

Comment: As far as the impact analysis, we do continue to be extremely concerned about the fisheries that inhabit Cape Cod Bay and in particularly the estuary of the Jones River which are in sever decline. We have concerns about the methods and approach and the limitations of the approach in the document, although I do admit that I found the document extremely interesting and informative reading. However, because the populations of herring, Alewife, Rainbow Smelt, Shad, American Eel are all in severe decline in the Jones River and elsewhere on the Atlantic Coast region, I believe that even the assessment of moderate impact is inaccurate, and that continued impingement and entrainment of these types of species on the Pilgrim intake screens is severe. (PNPS-D-I)

Response: *The comments, in general, are in opposition of license renewal at PNPS based on concerns regarding PNPS's once-through cooling system. As part of the NEPA process, NRC has evaluated the impacts related to impingement and entrainment of aquatic organisms, the thermal plume, and other potential or actual aquatic impacts. The NRC's conclusions regarding these impacts, as well as potential mitigation measures, are presented in Chapter 4 of the SEIS. These comments provide no new information, and no changes have been made to the SEIS.*

Comment: On page 4-35, the DSEIS indicates that "ENSR (2000) determined that, of the behavioral barriers evaluated, light barriers would be the most effective as several studies have shown that some fish species are attracted to light." This statement should be clarified since an effective barrier would typically repel, not attract, fish. (PNPS-D-OO)

Response: *Section 4.1.4 has been clarified to note that the effectiveness of light barriers as a deterrent has been contradictory; in some studies fish are attracted to light, while in other studies fish are repelled by light.*

Comment: Habitat restoration and fish stocking justify the loss of viable fish and may not solve the lessening of the fish population due to PNPS cooling systems operations. Of the 35 species listed in Supplement 29, as effected by either entrainment and or impingement or both, 16 appear to be listed as possible fish consumed by humans. The effects on the fish by chlorination, heat shock and normal discharge of waste as the result of proximity to PNPS could potentially reach human population as the result of consuming the fish listed.

These fish include: Mackerel, Black Sea Bass, Bluefin Tuna, Blue Fish, Pollock, Atlantic Cod, Haddock, Monkfish, Summer Flounder, Winter Flounder, Yellow Tail and Long Fin Squid. Again, the concern here is human consumption and the possible deleterious effects. (PNPS-D-LL)

Response: *The discharge of chlorine and other biocides and the accumulation of contaminants by biota (such as from heavy metals in condenser cooling water discharges) have been determined to be Category 1 issues for license renewal for all nuclear plants. The effects of heat shock on fish is a Category 2 issue specifically evaluated in Section 4.1.3. The comment provides no new and significant information. Therefore, no changes have been made to the SEIS in response to this comment.*

Comment: Page 2-7, Lines 38-40; Page E-60, Line 17-20 - The sentence "The mixture is used to ensure the total residual chlorine discharge concentration does not exceed a maximum daily concentration of 0.10 parts per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge." is incorrect. The Condenser Cooling Water NPDES Permit total residual chlorine limitations are "0.10" maximum daily and "0.1" average monthly. The Plant Service Cooling Water NPDES Permit total residual chlorine limitations are "1.0" maximum daily and "0.5" average monthly. (PNPS-D-MM)

Response: *Section 2.1.3 has been changed in response to this comment.*

Comment: Terminology needs be explained. Such key language as "significant", "moderate", "less than substantial", "minimal adverse" need qualifying definitions in order to understand the implications of the SEIS. (PNPS-D-NN)

Response: *Section 1.2.1 of the DSEIS explains the basis for the NRC's standard of significance and defines the three-level system for classifying the significance of impacts (small, moderate, or large) based on consideration of their context and intensity. The other terminology noted in the comment (minimal adverse, less than substantial) was employed in*

classifying impacts in the Essential Fish Habitat Assessment included in Appendix E and is based on NMFS guidance. The comment provides no new and significant information. Therefore, no changes have been made to the SEIS in response to this comment.

Comment: We also note the discussion in the DSEIS at page 4-27 which states, "Although the loss of winter flounder juveniles and adults through impingement may be contributing to population declines, the level of impact is considered to be minimal when compared to the potential entrainment impacts." We suggest that this comparison is inappropriate and that instead of comparing the two types of impact (entrainment and impingement) that may contribute to population declines, they both be considered together in the cumulative impact discussion. (PNPS-D-OO)

Response: *Sections 4.1.2.2 and 4.8.1 have been changed in response to this comment.*

Comment: Section 4.1.2.1 of the DSEIS explains that 97% of the over 300,000 fish impinged during 2005 were Atlantic menhaden and that their survival was low (18 and 27%). In addition, there were 19 impingement events (>20 fish/hr) in 2005 which consisted primarily of Atlantic menhaden and Atlantic silversides. Even though the DSEIS acknowledges that "menhaden is one of the most commercially important fish species along the Atlantic Coast" (DSEIS page 2-37), there is little discussion regarding the impact of the impingement losses in Section 4.1.2.2 other than relying on ENSR reports and general statements such as "[t]he Atlantic menhaden stock is considered to be healthy with stable stock size and high biomass." Furthermore, although the DSEIS recognizes that "due to the lack of recent information describing the status of several local populations, it is difficult to quantify impingement impacts," it concludes that "impacts on marine aquatic species other than the Jones River population of rainbow smelt would be minor." EPA recommends that the FSEIS expand on this discussion of impingement impacts more fully explain the basis for the conclusion that the impacts would be more. (PNPS-D-OO)

Response: *Sections 4.1.2.2 and 4.1.2.3 were modified to address this comment.*

Comment: Page 2-30, Lines 22-24 - Suggest changing the sentence "However, these tests indicated that sediment from the intake embayment would have a significant impact on the survival of the amphipod (*Ampelisca abdita*), and the development of the larval stage of the blue mussel (*Mytilus edulis*)." to "Although unrelated to PNPS operations, these tests indicated that sediment from the intake embayment would have a significant impact on the survival of the amphipod (*Ampelisca abdita*) and the development of the larval stage of the blue mussel (*Mytilus edulis*)." (PNPS-D-MM)

Response: *The NRC staff reviewed the toxicity testing results and edited Section 2.2.5.2 to clarify that the followup testing indicated that toxicity to the amphipod* Ampelisca abdita *and larvae of the blue mussel (*Mytilus edulis*) appeared to be limited to a single location and may have resulted from ammonia. Ammonia is a naturally occurring chemical in sediment that can be toxic to invertebrates.*

Comment: Sand Tiger Shark (*Odontaspis Taurus*). This animal is not mentioned in the SEIS, which we bring attention to here, as it is designated by NMFS as a Species of Concern Designation, and it has been caught and tagged over the past two years in the Jones River estuary. From evidence of the fish caught, we know that the sand tiger feeds on striped bass, and we know that Striped bass feed on smelt, herring and menhaden, etc.

We are concerned as we have stated above, that the SEIS has so segmented its analysis of the impact on fisheries as to lose sight on the general and cumulative impact upon the web of fish in the food chain. Ecosystem analysis requires that the operation is evaluated against broad impacts to Cape Cod Bay populations and habitats as well as upon the 66 or species of fish impinged and entrained by plant operations. We do not know enough about Cape Cod Bay and its dependent species to be confident in the assessment that MODERATE impacts on smelt and winter flounder are only that, and can be ignored. (PNPS-D-NN)

Response: *As described in Section 2.2.5.3.1, the SEIS identified a group of important fish species for evaluation as representatives of the potentially affected fish community in western Cape Cod Bay. These included species that are commercially or recreationally valuable, species critical to the ecosystem, and species for which essential fish habitat (EFH) has been designated in the vicinity. The sand tiger shark was determined not to meet these criteria and has never been reported to have been entrained or impinged at PNPS. In addition, although the sand tiger shark is designated as a species of concern by the NMFS (NOAA Fisheries 2004), it is an opportunistic feeder and therefore it may prey on many different fish species. Potential food chain effects were considered in the assessment, as discussed in Section 4.8 on Cumulative Effects and in the EFH Assessment (Appendix E). Due to limitations associated with each method of assessing fish populations and the significance of impacts, multiple methods were considered as lines of evidence in arriving at conclusions based on the weight of the available evidence. The NRC staff met with representatives of State and Federal agencies prior to development of the SEIS to discuss methods of evaluating impacts to marine fish populations. Multiple methods can be used to evaluate status and trends of these populations. The basis for the conclusions regarding the species evaluated are described in Sections 4.1.1 and 4.1.2. Section 4.8.1 has been revised in response to this comment.*

Comment: In addition, JRWA is concerned that other species, especially the Jones River the Alewife and Blueback Herring have not been fully evaluated, and are being severely impacted by plant operations. Annually hundreds, and at times tens of thousands of this fish are impinged, and have been found in the plant cooling system, including in the spring prior to spawning. In 1995 the Alewife was the dominant fish impinged, while the Rainbow smelt have been dominant at least two years. (PNPS-D-NN)

Response: *As described in Section 2.2.5.3.1, the SEIS identified a group of important fish species for evaluation as representatives of the potentially affected fish community in Cape Cod Bay. These included species that are commercially or recreationally valuable, species critical to the ecosystem, and species for which essential fish habitat (EFH) has been designated in the vicinity. Neither blueback herring or alewife (collectively known as river herring) were determined to have EFH in the vicinity of PNPS, and both are commonly impinged at PNPS, with greater numbers of alewife being affected. The fishery for these two species has recently been closed in Massachusetts. Based on NRC staff conversations with MADMF, the fishery is declining, but overall population data are unavailable. However, the level of take of these species by PNPS is relatively small. Over the last 25 years the annual average of alewife impinged is 2000 fish; however, there were five large impingement events (greater than 1000 fish) during this time frame. The median of the last 25 years would be 262 impinged fish per year. The alewife was chosen as one of the important species for evaluation, and it provides a conservative representation of potential impacts on the blueback herring due to their similar life histories and habitats. There is not an apparent relationship between alewife impingement numbers in recent years and current alewife counts in the Jones River.*

NRC staff evaluated the available data and determined that there are differences in impingement rates for individual species throughout the year. This is especially true of anadromous fish that have distance runs that pass within the vicinity of PNPS. The staff realizes that alewife and blueback herring are impinged in the spring prior to spawning. This was taken into consideration when developing the impact determination. It should also be noted that most data available for analysis of impingement impacts are not differentiated by season. The comment provides no new and significant information. Therefore, no changes have been made to the SEIS in response to this comment.

Comment: The following fish species were considered those suffering the greatest numerical losses due to impingement over the last 11 years of monitoring at Pilgrim (Environmental Protection Group 2005):

Table 1

Year	Atlantic silverside	Atlantic menhaden	blueback herring	grubby	rainbow smelt	alewife
1994	36,498	58	269	1,094	9,464	123
1995	13,085	1,560	1,244	648	2,191	39,884
1996	16,615	2,168	2,462	1,347	3,728	216
1997	6,303	1,329	424	405	1,978	317
1998	6,773	1,423	134	335	1,656	158
1999	8,577	42,686	550	628	875	610
2000	25,665	34,354	5,919	1,105	13	2,443
2001	4,987	3,599	229	517	879	1,618
2002	4,430	53,304	943	1,087	335	334
2003	23,149	119,041	1,968	237	532	438
2004	13,107	10,431	2,046	2,257	1,092	145

Of particular interest are the rainbow smelt. These fish are an anadromous species and smelt impinged at Pilgrim most probably come from the Jones River population. Although there are two other rainbow smelt runs (Town Brook and Eel River) in the Plymouth/Kinston/Duxbury Bay area they are apparently quite small in comparison to that from the Jones River (based on pers. comm., Brad Chase, MA Division of Marine Fisheries [DMF] to Gerald Szal, DEP). Rainbow smelt are not known to reproduce elsewhere in streams entering Cape Cod Bay or in streams elsewhere on Cape Cod. (PNPS-D-NN)

Response: *The comments provide no new and significant information, and no changes have been made to the SEIS in response to this comment.*

Comment: The moderate impact finding on Winter Flounder was based largely on what's called the equivalent adult model which takes numbers of eggs and larvae that pass through the plant and predicts how many adults would, could result from those based on many assumptions on their mortality rate. It's a screening tool and it's not designed to estimate mortality rates.

In 2000, 2002 and 2004 I was involved in what we call a larval transport study designed to measure how many Winter Flounder actually flow past the station in a typical spawning season, and based on that study, we estimated that much less than one percent of the Winter Flounder larvae passing the station are actually entrained, so I would urge you to focus on that more than the equivalent adult model. (PNPS-D-T)

Response: *The equivalent adult model and results from the larval transport study were both considered as part of the weight of evidence in determining that there was a potential for a moderate impact to local populations of winter flounder. This comment does not provide new*

and significant information, and therefore, no changes have been made to the SEIS in response to this comment.

Comment: Page 4-21, Lines 27-28 - " ... there were several methodological difficulties, which impart a high degree of uncertainty to these estimates." The Larval Transport Studies provide a direct method of measuring 'percent entrainment' of winter flounder at PNPS using larval densities from the plant and from Cape Cod Bay, obtained simultaneously. The obvious benefit to this approach is that it eliminates the reliance on hypothetical models (and their inherent uncertainties) and instead, uses real time field data collected at the site. The key challenge is to ensure that using a net to sample larvae close to the bottom (larval stages 3 and 4) does not underestimate the actual number of larvae present in the bay. As with many field studies, new techniques were employed to address this difficulty and they were not completely successful.

There was no problem with the stage 3 and 4 larval densities obtained from sampling in the discharge canal, which collects all larval stages with equal efficiency. To determine 'percent entrainment' these values were then divided by the number sampled in the bay. As a result, it was apparent that the few elevated entrainment values for stage 3 and 4 larvae obtained in 2002 and 2004 were due to low numbers of stages 3 and 4 collected in the bay (i.e. under sampling larvae close to the bottom). However, this discrepancy does not cause a high degree of uncertainty and it does not detract from the key conclusion that the amount of winter flounder larvae in northwest Cape Cod Bay entrained by PNPS is estimated (from direct measurement) to be less than 1 % of the net larval transport. (PNPS-D-MM)

Comment: Larval transport studies were conducted in 2000, 2002, and 2004 for the purpose of comparing the percentage of winter flounder moving by Pilgrim Station to that which is entrained through Pilgrim Station's cooling system. Page 4-12 of the DSEIS presents 2004 data that indicates a 20 percent entrainment rate of stage 4 winter flounder for one survey and less than 1 percent in another survey. The DSEIS indicates that the authors of the studies "emphasized that the higher rate may have been a result of some methodological difficulties such as lost sampling gear, resulting in no sample collection from several survey locations." We note that the DSEIS does not appear to include data to support these conclusions and we recommend that an expanded explanation of the higher entrainment rate be provided in the FSEIS. (PNPS-D-OO)

Response: *In response to these comments, additional discussion regarding the larval transport studies has been added to Section 4.1.1.1 in the SEIS.*

Comment: The DSEIS (DSEIS page 4-13) discusses the 2000 and 2002 larval transport data and adds that these "reports state that the periodic high entrainment rates observed for stages 3 and 4 larvae were likely due to difficulties in collecting the stages 3 and 4 larvae, as these larval stages generally are associated with the bottom sediments." It is our understanding that

stage 3 winter flounder are found in the water column. In addition, one of the two surveys in 2004 shows a stage 4 larval entrainment rate of 20 percent. We recommend that the discussion in the FSEIS reflect the entire data set. (PNPS-D-OO)

Response: *The DSEIS incorporated all of the results from the larval transport studies (including the 2004 data) in reaching the conclusion that there is a potential for a moderate impact to local populations of the winter flounder. This comment does not provide additional information and therefore no edits to the SEIS are necessary.*

Comment: Page 4-21, Lines 2-7 - Regarding "Normandeau (2006a) compared recent estimates of the loss of age 3 adults ... " referring to Table 4-4 references Normandeau as the source, and discusses the estimated percent loss of adults as if this terminology is used in the 2005 Annual Report referenced. However, the headers (description of data columns) presented in Table 4-4 are quite different from those in the reference document. One is also incorrect; the Area-Swept survey should be all adult winter flounder (those equal to or longer than 280 mm TL) not just age-3 fish. Please duplicate the entire table as it appeared in the original source, or eliminate the citation altogether. (PNPS-D-MM)

Response: *The NRC staff has revised the table, which is now Table 4-5, in response to this comment. Column headings and footnotes have been edited to more accurately describe the associated data and clarify its basis.*

Comment: Finally, although winter flounder is the only fish present in category 2 and subject to review, it appears data and collection of data might be altered to gain more accurate representation of how many larvae, eggs and fish are adversely effected by PNPS cooling system. Less than 1% appears to be a general category to place all the fish in various stages collected for analysis. Perhaps better technology could result in more accurate data. (PNPS-D-LL)

Response: *The NRC evaluated a number of aquatic species as part of the environmental review, as described in Chapter 2 and 4 of the SEIS, including winter flounder. These important fish and marine mammal species were identified as representative of the potentially effected aquatic community of Western Cape Cod Bay. The list included commercially or recreationally valuable species, species critical to the ecosystem, and species for which EFH has been designated by NMFS.*

NRC, through development of the SEIS, analyzes the potential impacts of renewing the plant's operating license. NRC does not have regulatory authority to impose fish monitoring requirements or implementation of the best technology available. EPA has such regulatory

authority under the Clean Water Act. Consequently, recommendations for the facilities monitoring program are beyond the scope of the SEIS. Therefore, no changes to the SEIS were made in response to this comment.

Comment: Page 4-12, Lines 16-17 - Regarding "The abundance estimates in 2005 were <50% of the 1995-2004 time series. " This sentence, given without any perspective, may lead to the wrong conclusion about the status of winter flounder in Cape Cod Bay. The 2006 estimate of immature winter flounder was the fourth highest over the 12-year monitoring series, indicating that an ample amount of recruitment is occurring, which propagates the population in the vicinity of PNPS. (PNPS-D-MM)

Response: *Section 4.1.1.1 has been revised in response to this comment. The conclusions in the SEIS are based on the latest data available to the NRC staff (PNPS Marine Ecology Studies Report No. 67, 2006).*

Comment: Section 4.1.1.4 of the DSEIS "concludes that the impact of entrainment on marine aquatic species other than the winter flounder population would be minor." However, it does not appear that this conclusion is fully supported in the DSEIS and EPA encourages a closer evaluation of measures to mitigate the adverse impacts of the once-through cooling system. Without effective mitigation measures to reduce entrainment, several fish species will be adversely affected. The DSEIS (DSEIS page E-I 05) acknowledges this impact by indicating that the continued operation of the Pilgrim Station cooling water system would have a "substantial adverse effect on EFH for 7 species" in the vicinity of Pilgrim Station. (PNPS-D-OO)

Response: *Section 4.1.4 provides an overview of potential mitigation measures to minimize adverse impacts to marine resources. Therefore, a detailed evaluation of the potential feasibility of each of these measures to address impacts associated with PNPS was not conducted. Requiring implementation of such mitigation measures is beyond NRC's regulatory authority but would fall within EPA's authority under the CWA. Section 4.1.1.4 has been changed in response to the comment.*

Comment: Also, EPA's scoping comments suggested that the DSEIS should include the consideration of a biological surveillance program to address impacts to fish. This measure does not appear to be analyzed in the DSEIS and EPA continues to recommend that this impact minimization option be more fully explored in the FSEIS. (PNPS-D-OO)

Response: *The USEPA Region I scoping comment referred to in this comment recommended evaluation of the possibility of implementing a biological surveillance program to determine when impact mitigation measures such as barrier nets should be deployed. The program would be intended to identify the presence of large populations of fish susceptible to being attracted to*

the thermal plume and discharge canal. The intent of Section 4.1.4, Potential Mitigation Measures, is to provide a general overview of the potential mitigation measures that may be applicable to PNPS. Thus, a detailed discussion of the effectiveness of implementing a biological surveillance program in conjunction with diversion devices is outside the scope of this analysis. Section 4.1.4 has been changed in response to this comment.

Comment: Page 2-30, Lines 8-9 - On page 2-11 (lines 30-32) it is stated that "The sediments were described as having relatively low concentrations of the chemical parameters tested polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, .. .". However, Page 2-30 (lines 8-9) states "PAHs, pesticides, and PCBs were not detected in any sediment sample." These statements appear to contradict each other. (PNPS-D-MM)

Response: *The first discussion refers generally to the wide range of chemicals tested as having relatively low concentrations, and it lists PCBs, PAHs, pesticides, petroleum hydrocarbons, and heavy metals as the tested chemicals. However, PAHs, pesticides, and PCBs were not detected at all while low concentrations of petroleum hydrocarbons and heavy metals were detected in sediment samples. The second discussion, more specifically states that PAHs, pesticides, and PCBs were not detected in the samples. The first discussion in Section 2.1.3 has been changed in response to this comment.*

Comment: Page 2-28, Lines 1-2 - Suggest deleting the first sentence that starts with "Water depths ... ", and replace with 'Water depths in the vicinity of PNPS are typically 10 ft and up to 120 ft within 5 miles off shore of the site." (PNPS-D-MM)

Response: *Section 2.2.5.1 has been revised in response to this comment.*

Comment: EPA's scoping comments requested an update of the analyses of thermal plume impacts in light of current information and it appears that the DSEIS only provides a summary of existing data from 1995 and 2000 reports. EPA recommends that the FSEIS provide more recent data if they are available. (PNPS-D-OO)

Response: *The assessment of thermal impacts in the SEIS was based on the most recent data available. Although more recent data are desirable, it is unlikely that the characteristics of the thermal plume have changed significantly since the studies cited in Section 4.1.3 were performed. The comment provides no new and significant information. Therefore, no changes have been made to the SEIS in response to this comment.*

Comment: I also feel the occurrence of heat shock as a category 2 issue should be thoroughly examined and data taken as to how fish are effected by this occurrence. (PNPS-D-LL)

Comment: In addition, I think that there needs to be some consideration given to the facts of global warming …

I think, in general, the ocean is getting a little warmer, certainly the bay is getting warmer, and I believe that it is in part getting warmer not only because of global influences but because there is a continual daily thermal discharge of superheated water from the plant as a result of the cooling function. And that the documents do not consider the impact of that general warming upon the bay, upon the essential fish habitat and upon the species that live there, and I think this was a flaw in the supplement and I believe that it should be corrected in the final, that the warming of the bay water has to be considered.

What was considered was the shock to the species, in terms of the discharge and I believe that the report basically says, well, a fish can swim away from superheated water, and while I believe that's true, I think if the general warming pattern is there, then we are kind of --. Like us in this room, we are sort of all stuck with the environment that we happen to be in at the moment and if you can't get out of it, you have to suffer the result. That is what's happening to our marine fisheries, and there is a bigger impact than locally to Pilgrim or locally to the Jones River, and we have to pay attention to that and we cannot delay that attention any longer, anymore than we can delay the attention given to some of the other concerns. (PNPS-D-I)

Response: *The analysis of thermal impacts in Section 4.1.3 was based on measured temperature differences within the bay, the extent of the plume throughout the tidal cycle, and the minimal effects documented by the biological monitoring programs in the affected area. It should be noted that the water leaving the plant is not superheated. Superheated water is water that has been heated above its boiling point under pressure that prevents it from vaporizing. The maximum permitted temperature of the condenser cooling water at the outfall is 102°F, less than half the boiling point temperature. Thermal plume studies found that water temperatures measurably exceeded ambient water temperatures in a localized area within Cape Cod Bay near PNPS. However, any incremental contribution of heat to the bay from the discharged cooling water would be negligible in the comparison to regional and global influences on water temperatures in the bay. These comments provide no new and significant information; therefore, no changes have been made to the SEIS in response to these comments.*

Comment: There are details about sediment collected and analyzed from Mass Bay area. "Metals, PAH's, PCB's, pesticides and radionuclides" were found and identified, however, the conclusion of the data stated, " Mass Bay sediment were no more contaminated than those of other urban estuaries." They were concluded as being "healthy" and of no concern. I understand the comparative analysis of this data as beneficial to the understanding of the sediment collected in Mass Bay. However, I feel the presence of toxins in the sediment should also be taken into account and evaluated as such. Describing the results of analysis as

"healthy" due to their presence in "other urban coastal regions on the East Coast" seems to be faulty analysis and again, data should be analyzed and concluded on the basis of how these chemicals relate and effect the surrounding ecosystem. The effect can not be dismissed because other coastal estuaries exhibit similar toxins in the sediment. (PNPS-D-LL)

Response: *The text did not state that the sediment was healthy because of the comparison to other coastal regions on the east coast, as suggested in the comment. The effect was not dismissed based on comparison to other coastal estuaries. Instead, the text states that determination that the sediment was healthy was based on a comparison of the contaminant concentrations in the sediment to sediment toxicity effects levels from the U.S. National Oceanographic and Atmospheric Administration (NOAA). The study was a general assessment that was not directly related to evaluation of PNPS operations. However, the conclusion that the sediments were no more contaminated than other coastal regions provides information suggesting that PNPS has not had a measurable effect on the sediment, and the comparison to NOAA standards indicates that neither PNPS nor the widespread industrialization near Massachusetts Bay has resulted in sediment contamination that exceeds toxic levels. This comment provides no new and significant information; therefore, no changes have been made to the SEIS in response to this comment.*

Comment: EPA's scoping comments asked that the DSEIS contain a discussion of future dredging needs for the facility. The DSEIS at page 4-69 explains that the applicant doesn't plan to dredge. However, the DSEIS at page E-63 explains that dredging occurred in 1982 and 1990. While the applicant may have no plans to dredge at this point in time, EPA recommends that the FSEIS reflect that dredging of portions of the facility over the relicensing term may be likely given the past dredging history of the facility. (PNPS-D-OO)

Response: *NEPA is designed to evaluate reasonably foreseeable actions. Since the last dredging action occurred over 17 years ago and did not have the intended outcome of bringing cooler water into the cooling system, Entergy has stated that they do not intend to dredge in the future. Therefore, NRC does not believe that future dredging of portions of the facility is a reasonably foreseeable action that needs further evaluation. This comment provides no new and significant information; therefore, no changes have been made to the SEIS in response to this comment.*

Comment: ...it's my opinion, and we will comment this way, that there should be no relicensing certainly without considerable modification to the intake and discharge structure that provided cooling water to the plant. (PNPS-D-I)

Comment: Also, I hope there is careful consideration regarding,

"Entrainment of fish and shellfish in early life stages into nuclear power plant cooling water system" as "considered a category 2 issue, thus requiring a site specific assessment for the license renewal review."

It is also clearly stated in supplement 29, "section 316 (b) of the clean water act (CWA) requires the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts." Important data will be the result of the Entergy study regarding PNPS cooling systems. Especially in light of the EPA 316(b) regulations. (PNPS-D-LL)

Comment: PNPS is obligated as a co-habiter of it's surrounding Cape Cod Bay ecosystem to make necessary improvements to the cooling system as it currently operates. Some of the best solutions for improvement to Aquatic Marine Populations and Cape Cod Bay waters from the list seem to be the following (as outlined in Supplement 29).

- Automated chlorine monitoring
- Alternative intake systems
- Alternative intake screen systems
- Variable speed pumps
- Closed cycle system

If a closed cycle system includes changes in the use of water from Cape Cod Bay to another source not associated with the surrounding environment, then this would solve the problems associated with entrainment, impingement and pollution of chlorine into Cape Cod Bay. Further, if alternative intake systems refers to another source of water for cooling and again another source for disposing of the chlorinated water, then this would solve the problem of entrainment, impingement and pollution to Cape Cod Bay. (PNPS-D-LL)

Comment: I am very pleased with the policy of PNPS and the governmental policy as follows:

"Entrainment of fish and shellfish into the cooling water system is a potential adverse environmental impact that could be minimized by use of the best available technology."

"Licenses are required to demonstrate compliance with the phase 2 requirements at the time of renewal of their NPDES permit." (PNPS-D-LL)

Comment: Pages 4-34 thru 4-38, Section 4.1.4 - Discussion of these alternatives and their possible application at PNPS should be left to the 316(b) process currently underway. (PNPS-D-MM)

Comment: Pages 4-34 thru 4-38, Section 4.1.4 - The NRC is not known to have been delegated authority under the Clean Water Act to make recommendations regarding mitigation measures associated with "aquatic matters". In addition, 316(b) is associated with numerical performance standards and does not define "impact'. Mitigation measures in the future, if any, will be developed and jointly agreed upon between USEPA Region I and Entergy as part of the 316(b) compliance process. (PNPS-D-MM)

Comment: JRWA is concerned that the adverse environmental impact from impingement and entrainment at PNPS of fish and aquatic organisms that depend on Cape Cod Bay and the Jones River estuary is so severe as to require a change to the once-through cooling system, or a halt to plant operations. No re-licensing should occur without change to a closed-loop cooling system or better available technology. Further, the evidence suggests that impacts to fisheries over the past thirty years have been instrumental in causing declines in fish species populations-especially Rainbow smelt, Alewife, Blueback Herring, as well as winter flounder and others-and therefore, substantial increase in mitigation strategies must be required. (PNPS-D-NN)

Comment: As soon as the best method can be determined, and prior to any extension of permit or license for operation, the salt water intake and discharge for the once-through cooling system at Pilgrim Nuclear Power Station must be retrofitted to avoid if possible, and mitigate where as necessary, adverse impacts to the aquatic populations of Cape Cod Bay and its regional estuarine systems. The SEIS and other reports describe now caused by impingement and entrainment of aquatic life forms at levels that adversely impact the Cape Cod Bay Sanctuary through unacceptable reduction in fish populations, especially populations of Rainbow smelt, Alewife, Blueback herring, winter flounder, Atlantic mackerel, Atlantic cod, and other fish important to the ecosystem function and balance of the bay as a whole, and to the Jones River in particular. (PNPS-D-NN)

Comment: Retrofits to the intake and discharge structure should be required to avoid fish kills. (PNPS-D-NN)

Response: *The comments, in general, express concern regarding PNPS's once-through cooling system. NRC has evaluated the impacts related to impingement and entrainment of aquatic organisms, the thermal plume, and other potential or actual aquatic impacts. The NRC's conclusions regarding these impacts, as well as potential mitigation measures, are presented in Chapter 4 of the SEIS.*

NRC does not have the regulatory authority under the CWA to require changes to the PNPS cooling water system. Entergy cannot operate the cooling water system without a NPDES permit, which is issued by USEPA Region I. In the absence of USEPA Region I requirements, NRC has not included retro-fitting PNPS to closed-cycle cooling in Chapter 8, Alternatives.

Instead, closed-cycle cooling is addressed in Chapter 4 as part of the potential mitigation measures associated with the PNPS cooling system. These comments provide no new and significant information; therefore, no changes have been made to the SEIS in response to these comments.

Comment: The DSEIS analysis of closed-cycle cooling in Chapter 8.0 (the environmental impacts of alternatives to license renewal) considers the impacts of closed-cycle cooling associated with the construction of a new nuclear generating station at a greenfield site. In addition to considerations of closed-cycle cooling at a greenfield site, EPA recommends that the analysis of alternatives be expanded to include an evaluation of a retrofit of the existing Pilgrim Station facility to closed-cycle cooling. (PNPS-D-OO)

Response: *Chapter 8.0 presented an analysis of alternatives that are potentially available to replace the generating capacity that would be lost if the PNPS OL were not renewed. The focus in that section was on alternative energy producing facilities that could reasonably be expected to operate as base load generating stations since PNPS typically operates at a capacity factor over 90%.*

It is the case, as the comment notes, that one of the base-load systems considered in Chapter 8.0, was a nuclear plant operating with closed-cycle cooling at a greenfield site. The purpose in doing so was to present a general assessment of the implications of developing an integrated power complex (energy source, transmission lines, auxiliary facilities, and cooling tower) to replace the output of PNPS. In that context, the broad scale benefits and impacts of the cooling system portion of the integrated generating station complex could be readily stated. The objective of the analysis was not, however, to present the detailed cost and benefits of a power plant cooling system at a hypothetical greenfield site.

NRC does not have delegated authority under the Clean Water Act to mandate mitigation measures associated with "aquatic matters", specifically mitigation measures associated with PNPS's once-through cooling system. PNPS's once-through cooling system is currently being evaluated by USEPA Region I as a part of Entergy's NPDES permit renewal. USEPA Region I has not issued any guidance regarding potential requirements for retro-fit of PNPS to closed-cycle cooling. In the absence of requirements or guidance, NRC has determined that retro-fitting PNPS to closed-cycle cooling is not a reasonably foreseeable action and has not included this option in Chapter 8, Alternatives. Instead, closed-cycle cooling is addressed in Chapter 4 as part of the potential mitigation measures associated with the PNPS cooling system. In conclusion, no changes have been made to the SEIS.

Comment: Bald Eagles, red-bellied cooters, roseate terns, piping plovers, barn owls, arctic terns, least terns, vesper sparrows, northern parula and common tern all reside or have once resided in and around the PNPS area. They are also federally listed as endangered threatened

species and depend on the PNPS area and surrounding area for survival. As early as 2005 juvenile Bald Eagles were observed at Plymouth Plantation and "wintering Bald Eagles occasionally occur in the area of PNPS.

Further "1400 feet of the transmission line ROW near it's southern and adjacent to the boundary of Myles Standish State Forest is designated critical habitat for the red bellied cooter. (Critical habitat is habitat that is considered essential to the conservation of the species and may require special management)."

These species are under the care of our federal government and PNPS is required to protect the place they live. If the PNPS site interfere with their viability and health, any problems caused by the operation of PNPS needs to be resolved immediately. (PNPS-D-LL)

Response: *The SEIS evaluated the potential for adverse effects on all threatened or endangered species, including all species referenced in the above comment, potentially occurring in the vicinity of PNPS and its transmission line ROW, in Section 4.6. NRC consulted with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act of 1973, as amended, regarding listed species within their jurisdiction. The conclusion of the staff was that impacts on such species during the renewal period would be small. On May 23, 2006, FWS concurred with NRC's conclusion and informally concluded the consultation. The comment provides no new and significant information; therefore, no changes have been made to the SEIS in response to this comment.*

Comment: Page E-89, Lines 5-10 - states "Continued operation of PNPS may also have the potential to affect prey items of various life stages of the red hake, as several prey items of the red hake (zooplankton, squid, herring, flatfish species, and mackerel) have been commonly reported in the impingement and entrainment sampling program at PNPS.

Red hake like Atlantic cod frequent deeper waters further offshore than those around PNPS. This is supported by the 13-year trawl survey conducted by the Massachusetts Division of Marine Fisheries (Lawton et al. 1995). Red hake were not among the top six taxa collected in that study that involved 1,322 bottom tows between 1970 and 1982. Red hake also prefer softer bottoms composed of mud and sand (Collette and Klein-MacPhee 2002) than is prevalent around PNPS.

Red hake larvae, juveniles and adults are opportunistic feeders that prey on a wide variety of taxa (Luczkovich and Olla 1983, Bowman et al. 2000). Their prey changes seasonally and throughout their life history (Steimle et al. 1999). Larval red hake prey on cope pods and other microcrustaceans, whereas juveniles consume chaetognaths (arrow worms) and small benthic and pelagic crustaceans including amphipods, decapods, mysids, euphausiids, and copepods. Adult red hake prey on crustaceans, an assortment of fish species such as haddock, silver

hake, sand lance and mackerel, and squid (Steimle et al. 1999). The dominance of these prey items changes seasonally, for example "Copepods are important in the fall and winter; arrow worms are eaten in the spring and summer" (Collette and Klein-MacPhee 2002).

It is unlikely that red hake would be indirectly affected by entrainment of planktonic organisms such as zooplankton that provide food for larger invertebrate prey and small fish - studies have shown that these lower trophic level organisms typically survive entrainment. In studies at PNPS zooplankton entrained generally showed high survival rates ranging from 95% to 100% at most operating conditions (Bridges and Anderson 1984). Larger invertebrates like squid are impinged at PNPS but the annual number is not large. The estimated annual average number of squid impinged is only 81 animals over the 26-year period from 1980 - 2005. Squid spawn year round, grow rapidly, and are short lived (Cadrin 2000). Therefore the impingement of small numbers of these animals is not expected to impact the food supply for red hake.

Atlantic herring eggs are not entrained at PNPS because they are demersal and adhere to the substrate when spawned. While herring larvae are entrained they originate primarily outside Cape Cod Bay and those entrained originate from a large pool of larvae distributed throughout the Gulf of Maine and Georges Bank and not a localized population (ENSR 2000, Normandeau 2006). Assessment of the potential effects of larval entrainment indicate that equivalent adult losses amount to about 0.007% of the regional spawning stock biomass. While herring are impinged on the PNPS intake screens the annual estimated number averages only 1,179 fish (1980 - 2004, Normandeau 2006).

Atlantic mackerel eggs and larvae are entrained by the circulating water system and juveniles and adult are occasionally impinged on the intake screens at PNPS. Analyses suggest that the number of age-1 fish that might reasonably be expected to result from the numbers of eggs and larvae entrained had they all died are equivalent to 0.2% of the local mackerel landings. Ichthyoplankton have also been widely shown to survive entrainment by circulating water systems at power stations including PNPS (MRI 1978, 1982, Ecological Analysts 1981, EPRI 2000, LMS 2001). Atlantic mackerel are swift swimmers and they are not often impinged at PNPS. They occurred in samples during only six years from 1980 - 2005 with an average of five individuals annually. In any event, neither entrainment, nor impingement results in the removal of plants and animals from the ecosystem. Thus, even those plants and animals that do not survive passage through the Station settle to the bottom where they provide food for benthic invertebrates that in turn provide food for red hake.

Based on their preference for deeper waters and soft bottom and varied diet it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of red hake. (PNPS-D-MM)

Comment: Page E-99, Lines 8-13 - states "Continued operation of PNPS may also have the potential to affect prey items of the winter flounder, as they have been described as omnivores preying on a variety of fish and invertebrate species, many of which have been commonly reported in the impingement and entrainment sampling program at PNPS."

Winter flounder is a widely distributed species that is found over a variety of sediment types including mud, sand, cobble, and rocks (Pereira et al. 1999). They are among the more abundant larvae entrain at PNPS and typically occur on the intake screens (mean occurrence of 917 fish from 1980-2004; Normandeau 2006).

Winter flounder are opportunistic feeders that prey on a wide variety of taxa. Larvae feed on abundant forms of phytoplankton and zooplankton such as diatoms, rotifers, dinoflagellates, and copepods (Pearcy 1962, Klein-MacPhee 1978, MRI 1979, 1983). Juveniles are "euryphagus"; 27 organisms representing 7 phyla having been identified in their stomachs by Pearcy 1962 (see also Klein-MacPhee 1978). Adult winter flounder are described as omnivorous "eating whatever is available" (Klein-MacPhee 1978). Chief prey items include polychaete worms, anthozoans, isopods and amphipod shrimp. They also prey on small crabs, squid, bivalves and other taxa small enough to be consumed with their small mouth (Bowman et al. 2000). MacPhee (1969) reported that the most important category of food in a winter flounder's diet depends on the type of bottom on which a fish resides.

The DSEIS suggests that winter flounder essential fish habitat will be adversely affected by continued operation of PNPS because a variety of fish and invertebrate species are entrained and/or impinged. This is unreasonable because all life stages of winter flounder are opportunistic feeders that prey on a wide variety of taxa. It is unlikely that flounder would be directly or indirectly affected by entrainment of planktonic organisms such as phytoplankton and zooplankton - studies have shown that these lower trophic level organisms typically survive entrainment. Zooplankton entrained at PNPS generally showed high survival rates ranging from 95% to 100% at most operating conditions (Bridges and Anderson 1984). Very small fish are entrained by the circulating water system at PNPS but they have been widely shown to survive entrainment by circulating water systems at other power stations (Ecological Analysts 1981, EPRI 2000, LMS 2001). Small fish are also impinged on the intake screens at PNPS but many of them have been shown to survive (MRI1984, Normandeau 2006). In any event, neither entrainment nor impingement results in the removal of animals from the ecosystem. Thus, even those animals that do not survive passage through the PNPS circulating water system remain available as food for flounder as well as other animals that are known to become prey for winter flounder.

Based on their wide geographic range and varied diet and given that prey are not removed as a result of entrainment and impingement it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species. (PNPS-D-MM)

Comment: Page E-73, Lines 38-39 - The DSEIS states" Eggs and larvae of the American plaice dominated entrainment studies at PNPS ... "

As widely reported in the fisheries literature adult and juvenile American plaice prefer moderately deep water and are found near shore only in colder waters in the northern Gulf of Maine approximately 250 miles north of Pilgrim Nuclear Power Station (PNPS) and on northward to Newfoundland and Greenland (Collette and Klein-MacPhee 2002). "Adults have never been caught in less than 18 m of water in the Gulf of Maine, and their preferred depth off the coast of Maine is 100-119 meters" (Sherman et al. 1993). This is far deeper than the 5 to 10 meter depths near PNPS. This reported distribution is consistent with local collections conducted by the Massachusetts Division of Marine Fisheries as no American plaice were taken in 13 years of their bottom trawl survey in the waters around PNPS (1970 -1982; Lawton et al. 1995). The Division of Marine Fisheries completed 1 ,322 trawl tows over that period of time using methods and equipment that would have been expected to capture American plaice were they present in the area. Plaice also were only rarely collected in more recent intensive spring bottom trawl sampling around PNPS from 1995 through 2006 and only two individuals were impinged at PNPS in the 27 years between 1980 and 2006 (Normandeau 2006). These data strongly suggest that PNPS is not located within essential fish habitat for adult and juvenile plaice.

The DSEIS suggests that American plaice eggs dominate entrainment studies at PNPS. This statement represents a misunderstanding of the PNPS entrainment data. Plaice spawn pelagic eggs primarily between March and May at a time of year when most fish spawn demersal adhesive eggs. They therefore account for a relatively high percentage of fish eggs only at that time of year although small numbers of them are entrained; typical monthly mean densities average less than 3 eggs per 100 m^3 of water. To state that eggs and larvae of the American plaice dominated entrainment studies at PNPS is misleading since such densities are small, particularly when compared to species that produce pelagic eggs at other times of the year.

The DSEIS also states that American plaice larvae dominate entrainment studies at PNPS. This is incorrect. Thirteen species of fish larvae typically account for 95% of the larvae entrained at PNPS on an annual basis and plaice is not included among those species. Monthly mean densities typically range between 0.1 and 2.1 larvae per 100 m3 of water during months when they occur at all and they occur only during the months of March through August when several years are considered together. In 2004, for example, they appeared only in April and May.

Finally, irrespective of the numbers of American plaice eggs and larvae collected at PNPS, entrainment of American plaice egg and larval life stages represents a mere fraction of those life stages present in the larger pool of plaice distributed throughout the Gulf of Maine and Georges Bank, not from a localized population inside Cape Cod Bay (ENSR 2000).

Ichthyoplankton collections from Cape Cod Bay (Scherer 1984) indicate that early stage American plaice eggs are most common at the mouth of the Bay well to the north of PNPS and consistent with their preference for colder, northern waters. For these reasons, it is unlikely that the continued operation of PNPS, including entrainment of American plaice eggs and larvae, will have a 'substantial adverse effect' on the essential fish habitat of this species. (PNPS-D-MM)

Comment: Page E-77, Lines 33-34 - states "Continued operation of PNPS may also have the potential to affect prey items of adult mackerel as several of its prey items (small squid and fish eggs) are commonly reported in the impingement and entrainment sampling program at PNPS."

Atlantic Mackerel adults are rarely found in the vicinity of PNPS since they are "fish of the open sea" and not "directly dependent either on the coastline or on the bottom in any way at any stage in their lives" (Collette and Klein-MacPhee 2002). Estimated total numbers impinged annually total five individuals over the 1980-2005 time period consistent with their preference for open ocean.

The DSEIS suggests that essential fish habitat for adult mackerel will be adversely affected by PNPS because squid and fish eggs are entrained and impinged. That conclusion is unrealistic because adult Atlantic mackerel consume a wide variety of prey including euphausiid, pandalid, and crangonid shrimp, arrow worms or chaetognaths, pelagic polychaetes, squid, copepods, amphipods, and a variety of fish species (Bowman et al. 2000, Collette and Klein-MacPhee 2002). They are opportunistic feeders -- "Practically all floating animals that are neither too large nor too small regularly serve to nourish mackerel" (Collette and Klein-MacPhee 2002).

Squid are impinged at PNPS but the annual number is not large. The estimated annual average number of squid impinged was only 81 animals over the 26-year period from 1980 - 2005. Squid spawn year round, grow rapidly, and are short lived (Cadrin 2000). Therefore, the impingement of small numbers of these animals is not expected to impact the food supply for mackerel. Fish eggs are entrained at PNPS and many of them are expected to survive (MRI 1978, 1982, Ecological Analysts 1981, EPRI 2000, LMS 2001). In any event, neither entrainment nor impingement results in the removal of plants and animals from the ecosystem. Thus, even those plants and animals that do not survive passage through the PNPS circulating water system remain available as food for other animals that are known to become prey for adult mackerel.

Based on the wide geographical range of adult mackerel, their primarily offshore distribution and varied diet, it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species. (PNPS-D-MM)

Comment: Page E-96, Lines 37-40 - states "Continued operation of PNPS may also have the potential to affect prey items of adult whiting, as several prey items of the whiting (small fish and squid) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations may have a substantial adverse effect on EFH for the whiting."

Whiting or silver hake are a wide ranging species utilizing the entire water column over the course of the day. They are not among the more abundant species of fish eggs and larvae entrained at PNPS and they appear on the intake screens only sporadically. Silver hake eggs were collected each year from 1999 to 2006; however, they were one of fourteen species that contributed less than 1 % to the annual egg collections during these years. Larvae were collected in 1999 to 2003, 2005, and 2006; however, they were one of thirty-eight species that contributed at most 7% to the annual larvae collections during these years (Normandeau 2006). Numbers of silver hake impinged annually averaged only 35 fish between 1980 and 2006 (Normandeau 2006). These observations are consistent with the reported distribution of the species which includes North American continental shelf waters from North Carolina to Newfoundland (Bigelow and Schroeder 1953) and suggest that silver hake are not in any way localized around PNPS.

The DSEIS suggests that whiting essential fish habitat will be adversely affected by PNPS because small fish and squid are entrained and/or impinged. This is unreasonable because adult and juvenile silver hake prey on a wide variety of taxa including many species of fish such as anchovies, hake, herring, mackerel, menhaden, alewives, sand lance, and silversides. They also feed on crustaceans and squid (Bowman et al. 2000, Collette and Klein-MacPhee 2002). They are opportunistic feeders and their diet varies with season and location (Lock and Parker 2004).

There is no information available on entrainment of small squid at PNPS. Larger juvenile and adult individuals are impinged at PNPS but the annual estimated total is not large. The estimated annual number of squid impinged averaged 81 over the 26-year period from 1980 - 2005. Squid spawn year round, grow rapidly, and are short lived (Cadrin 2000) therefore impingement of such a small number of animals is not expected to affect the ability of silver hake to find adequate food. Very small fish are entrained by the circulating water system at PNPS but they have also been widely shown to survive entrainment by circulating water systems at other power stations (Ecological Analysts 1981, EPRI 2000, LMS 2001). Small fish are also impinged on the intake screens at PNPS but many of them have been shown to survive (MRI 1984, Normandeau 2006). In any event, neither entrainment, nor impingement results in the removal of animals from the ecosystem. Thus, even those animals that do not survive passage through the Station's circulating water system remain available as food for other animals that are known to become prey for adult whiting.

Based on their wide geographical range and varied diet and given that prey are not removed as a result of entrainment and impingement it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species. (PNPS-D-MM)

Comment: Page 74, Lines 1-5 - states "Continued operation of PNPS may also have the potential to affect prey items of various life stages of the American plaice either through entrainment of phytoplankton, zooplankton, or ichthyoplankton, or via impingement of small forage fish species."

The National Marine Fisheries Service designates essential fish habitat using 10 minute squares of latitude and longitude. The size of each block varies with latitude but they are approximately 10 nautical miles on each side or approximately 100 square nautical miles in area. Such large blocks of habitat are of limited consequence in the open ocean but in coastal areas like Plymouth near shore blocks are designated as EFH even though a species preferred habitat is in deep water well removed from shore. That is notably the case for American plaice, which are rarely found in the immediate vicinity of PNPS because their habitat preference is moderately deep water. They utilize relatively shallow water only in the northern Gulf of Maine, Newfoundland and Greenland (Sherman et al. 1993, Collette and Klein-MacPhee 2002). Fisheries studies around PNPS as well as entrainment sampling at the site support these observations.

The diet of the juvenile and adult life stages of American plaice consists of a wide variety of invertebrate taxa, particularly benthic invertebrates including brittle stars, sand dollars, polychaetes, shrimp, and bivalves (Bowman et al. 2000). American plaice are opportunistic feeders - "They prey on practically any bottom-living animals that are small enough for them to devour" (Collette and Klein-MacPhee 2002). Their diet varies and shifts over time in response to relative abundance of prey items and to where they are located. For example, in southern New England they eat large quantities of amphipods, Crangon shrimp, polychaetes, and bivalves while on Georges Bank they consume primarily star fish, brittle stars, and sand dollars (Collette and Klein-MacPhee 2002). They occasionally eat small fish such as sand lance (Pitt 1967) but that does not appear to be an important part of their diet.

The primary contributors to the diet of American plaice are not directly affected by impingement at PNPS because many of the invertebrates they prey upon occur on the bottom where they are not subject to impingement. It is unlikely that they would be indirectly affected by entrainment of planktonic organisms such as phytoplankton and zooplankton that provide food for larger invertebrate prey - studies have shown that these lower trophic level organisms typically survive entrainment. At PNPS "the combined effects of heat and chlorine had no effect on survival rates" of entrained phytoplankton at temperatures below 17C (Bridges and Anderson 1984). The majority of productivity studies with entrained phytoplankton at PNPS indicated that productivity increased following entrainment (MRI 1978). Studies at other New England power

stations indicate that the ability of phytoplankton to carry out photosynthesis is not adversely affected by entrainment (MRI 1980). Zooplankton entrained at PNPS generally showed high survival rates ranging from 95% to 100% at most operating conditions (Bridges and Anderson 1984). Ichthyoplankton have also been widely shown to survive entrainment by circulating water systems at power stations including PNPS (MRI 1978, 1982, Ecological Analysts 1981, EPRI 2000, LMS 2001). In any event, neither entrainment, nor impingement results in the removal of plants and animals from the ecosystem. Thus, even those plants and animals that do not survive passage through the Station settle to the bottom where they provide food for benthic invertebrates that in turn provide food for American plaice.

Based upon the information above, continued operation of PNPS will not have a 'substantial adverse effect' on the essential fish habitat of the American plaice. Thus, it is erroneous for the DSEIS, in Appendix E, to suggest a potential food web or habitat impact. Plaice frequent deep water well removed from PNPS, their food supply is diverse and unlikely to be affected either directly or indirectly by entrainment or impingement. (PNPS-D-MM)

Comment: Page E-75, Lines 36-40 - states "Continued operation of PNPS may also have the potential to affect prey items of juvenile and adult life stages of the Atlantic cod as several prey items of the Atlantic cod (sand lance and herring) have been commonly reported in the impingement and entrainment sampling program at PNPS.

The National Marine Fisheries Service designates essential fish habitat using 10 minute squares of latitude and longitude. The size of each block varies with latitude but they are approximately 10 nautical miles on each side or approximately 100 square nautical miles in area. Such large blocks of habitat are of limited consequence in the open ocean but in coastal areas like Plymouth near shore blocks are designated as EFH even though a species preferred habitat is in deep water well removed from shore. That is notably the case for Atlantic cod. Cod juveniles and adults are typically found in deeper waters further offshore than those around PNPS (Collette and Klein-MacPhee 2002). While young fish are more common in coastal waters they move to deeper waters as they age and mature (Cote et al. 2003). This information is supported by the 13-year trawl survey conducted by the Massachusetts Division of Marine Fisheries from 1970 to 1982 (Lawton et at. 1995); cod were not among the top six taxa accounting for the majority of the catch in 1,322 bottom samples.

Regardless, diet of juvenile and adult Atlantic cod has been extensively studied throughout its range and they are known to eat a broad array of taxa (see for example Bowman et at. 2000, Collette and Klein-MacPhee 2002, Link and Garrison 2002). Their diet varies and shifts over seasons and years in response to relative abundance of prey items. For example, "Cod will pursue and gorge on squids anytime they are available." and "Any shellfish a cod encounters that can be swallowed whole is likely to be consumed." (Collette and Klein-MacPhee 2002). Fish, crabs, lobster, shellfish such as scallops, mussels and clams, squid, sea stars, sea

urchins, sea cucumbers, and shrimp are readily found in their stomachs. While fish are most often encountered in their stomachs they feed on a wide variety of species including Atlantic herring, Atlantic mackerel, sand lance, silver hake, redfish, and flounder.

The DSEIS states that continued entrainment and impingement of sand lance and herring will have a 'substantial adverse effect' on the essential fish habitat of the Atlantic cod. Sand lance eggs are not entrained at PNPS because they are demersal and adhere to the bottom. Atlantic herring eggs are not entrained at PNPS because they are demersal and adhere to the substrate when spawned. While herring larvae are entrained they originate primarily outside Cape Cod Bay and those entrained originate from a large pool of larvae distributed throughout the Gulf of Maine and Georges Bank and not a localized population (ENSR 2000, Normandeau 2006). Assessment of the potential effects of larval entrainment indicate that equivalent adult losses amount to about 0.007% of the regional spawning stock biomass. While herring are impinged on the PNPS intake screens the annual estimated number averages only 1,179 fish (1980-2004, Normandeau 2006). Sand lance are also occasionally impinged but they are uncommon, an annual average of only 53 fish being recorded over the 1980-2005 time period (Normandeau 2006).

Fish and invertebrates entrained and impinged on the intake screens at PNPS are not removed from the near shore waters of northwestern Cape Cod Bay. Small organisms that do not survive drift to the bottom where they contribute to the nutrition of local benthic organisms. Larger animals that may not survive entrainment or impingement are still consumed by scavengers such as crabs, lobsters, and fish; these in turn can be eaten by any cod that stray in the vicinity of PNPS. It is unlikely therefore that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species. (PNPS-D-MM)

Comment: Page E-97, Lines 35-39 - states "Continued operation of PNPS may also have the potential to affect prey items of the windowpane flounder, as one of its prey items (small fish) has been commonly reported in the impingement and entrainment sampling program at PNPS."

The DSEIS suggests that windowpane essential fish habitat will be adversely affected by continued operation of PNPS because small fish are entrained and/or impinged. This is unlikely because windowpane are widely distributed over muddy sediments throughout the Gulf of Maine (Chang et a!. 1999) and juveniles and adults are opportunistic feeders. They prey on a wide variety of taxa consisting chiefly on fish but also crustaceans. They also consume an assortment of other taxa including arrow worms, squids, mollusks, and polychaetes (Bowman et al. 2000).

Very small fish are entrained by the circulating water system at PNPS but they have been widely shown to survive entrainment by circulating water systems at other power stations (Ecological Analysts 1981, EPRI 2000, LMS 2001). Small fish are also impinged on the intake

screens at PNPS but many of them have been shown to survive (MRI 1984, Normandeau 2006). In any event, neither entrainment nor impingement results in the removal of animals from the ecosystem. Thus, even those animals that do not survive passage through the Station's circulating water system remain available as food for other animals that are known to become prey for windowpane.

Based on their ubiquitous distribution throughout New England waters and their varied diet and given that prey biomass is not removed as a result of entrainment and impingement it is unlikely that the continued operation of PNPS will have a "substantial I adverse effect' on the essential fish habitat of windowpane. (PNPS-D-MM)

Response: *The comments are noted, and generally concern Essential Fish Habitat (EFH). NRC staff does not determine the presence of EFH; rather, the National Marine Fisheries Service (NMFS) designates EFH for individual species. The EFH Assessment focuses on potential impacts on designated EFH in the vicinity of PNPS while the SEIS evaluates impacts on the marine ecosystem and its components. The EFH Assessment has been submitted to the NMFS, and the EFH consultation has been concluded by letter dated January 23, 2007 (ADAMS Accession No: ML070360071). Therefore, the EFH Assessment included in Appendix E is considered a final document, and no changes have been made.*

A.2.6 Comments Concerning Human Health Issues

Comment: Then they go to the BEIR 7 report and say there is nothing really new or significant there to change our determination. The reality is that what they didn't say is what the BEIR 7 report had to say on the incidents of cancer being a third higher than they previously thought.

What they didn't say was the BEIR 7, speaking specifically to the greater effect of low dose radiation exposure on women and children, over 30 percent higher in woman. What they didn't say is the new information on effect on workers, if they receive the maximum allowable dos, where NRC had said one out of eight would get cancer, now BIER 7, one out of four. All these things are clearly significant. What they didn't say in the draft was the BEIR 7 talked about health effects other than cancer that can be expected from low dose radiation exposure such as heart disease and stroke. (PNPS-D-D)

Comment: The NRC staff improperly concluded the cumulative impacts would be small, the analysis was improper for the following reasons. First, they ignored or misinterpreted new and significant information pertaining to Pilgrim that has occurred since the generic environmental impact statement was written in 1996. For example, the health impact was determined to be small because they misinterpreted that National Academy's BEIR 7 by saying the recent report was very, didn't differ, differed very little from the previous.

In fact, it stated that the incidents of cancer would be a third higher than previously thought, that women were 37.5 percent more likely to get cancer, that workers exposed to the allowable maximum dose, one in four would get cancer. (PNPS-D-Q)

Comment: Many radioactive elements seriously damage the molecular composition of living cells as the elements decompose and given off high energy particles/ radiation. Thousands of Japanese are still dying from the effects of our nuclear bombs (as are their descendents) due to genetic damage from the same radiation. (Why should human life, or, rather ALL life, on earth be placed in jeopardy in order to produce electricity ?) (PNPS-D-AA)

Comment: Then the NRC goes on in the draft to cite various studies that supposedly say there is no association between exposure and living and being near a reactor.

What they did was cherry-pick studies that were the industry's and government's equivalent of the tobacco scientists. What they failed to do is to look at all the recent research that is out there, and I would refer you, and I will in writing, to Clark University's Marsh Institute that has collected all research that is done on this area. (PNPS-D-D)

Comment: NRC staff cite cherry-picked health studies done by the nuclear industry's equivalent of "tobacco scientists" that supposedly, though mistakenly, demonstrate that there is no correlation between radiation dose from nuclear facilities and cancer to the general public and ignoring those studies that do show a correlation.

One Example: NRC highlights the University of Pittsburgh study that "found" no link between the radiation released during TMI's 1979 accident and cancer deaths among nearby residents. The DSEIS failed to mention a later study by Dr. Steven Wing, associate professor of epidemiology at the UNC-CH School of Public Health, who led a study of cancer cases within 10 miles of the facility from 1975 to 1985. He and colleagues conclude that following the March 28, 1979 accident, lung cancer and leukemia rates were two to 10 times higher downwind of the Three Mile Island (TMI) reactor than upwind.

For a comprehensive review of new and significant studies that indeed show a correlation between radiation dose from nuclear facilities and negative health effects in the general public, see: BEIR VII and Clark University's Marsh Institute, Health Risks of Ionizing Radiation -an overview of epidemiology studies, March 2006.
http://www.clarku.edu/departments/marsh/projects/community/EpiOverviewFinal.pdf
(PNPS-D-EE)

Comment: This was recommended back in 1990, we are talking about the future until 2032, so you can play your games and not analyze the real, the new and significant information that is out there, take your cherry-picked, tobacco science equivalent studies and continue pretending,

and also looking at acceptable dose to a mythical, mythical 30 year old healthy guy and not the effect that it should be on those who are most sensitive, which BEIR 7 points out are the young, the old and the sick. I think that's what I have to say about health. (PNPS-D-D)

Comment: The NRC draft concluded that there was nothing new or significant and the impacts from radiation on health would be small, they did this by misinterpreting and ignoring important significant information that pertains specifically here. Very basically, they ignored new and significant research that shows radiation's effects are cumulative and they affect the most vulnerable, the old, the young and the sick. (PNPS-D-D, PNPS-D-EE)

Comment: Standards, allowable releases: NRC's misrepresents the impact of radiation released from Pilgrim by inappropriately using the "standard man' or "reference man" as its basis for calculating risk and health effects. The so-called standard man is fully matured and healthy. BEIR VII states that risks for females and children are much larger than for a 'standard man.' That would cause the calculations for risks using the NRC's 'standard man' to be much lower than actually experienced by a population at risk unless the population at risk is composed totally of 'standard men.' The population of Plymouth County has 51.3% women and many children [7% under 5; 26% under 18] who are not correctly considered in the risk calculations (US Census data, 2000). Additionally, we know from new research that radiation affects the most vulnerable - the sick (discussed above), the young and the old. This makes intuitive sense - for example, the older we get, the more vulnerable we become and this is borne out by research. By 2030, (1) in (3) people will be over the age of 55, compared to 1 in 5 now. (PNPS-D-EE)

Comment: Demographics: Communities south of Boston will grow 13% and Plymouth is expected to add the most, about 10,000 residents - a population jump of over 20%. By 2030, 1 in 3 people will be over the age of 55, compared to 1 in 5 now. This is relevant to any analysis of health impacts, as new and significant studies have shown an increased sensitivity to low levels of ionizing radiation in older populations. (PNPS-D-EE)

Response: *Based on their reading of studies such as the BEIR VII report, the SMHS, and the Clark study, commenters concluded that the NRC staff's assessment of the impact of radiation dose from the operation of PNPS during the license renewal period is flawed. The commenters suggested that NRC and EPA dose standards are too high and do not account for differences in dose impact on the young, the elderly, and women.*

The assessment in Section 4.7 explains the basis for the NRC staff's conclusion that the impact from radiation exposure to the public is SMALL. The NRC staff concludes the impact is SMALL because doses to members of the public from PNPS effluents are well within the NRC and EPA

radiation dose standards. The doses are also much smaller than the doses that members of the public receive from other sources of radiation such as natural background radiation and medical procedures.

The dose standards were set conservatively by NRC and EPA based on the conclusions and recommendations of numerous national and international expert panels. These dose standards are based on the linear-no-threshold dose response model described in the BEIR VII (and in the Clark study).

The dose standards were set conservatively by NRC and EPA in part to account for the potential uncertainties noted by the commenters. The information and the studies put forth by the commenters did not change the NRC staff's bases or conclusions. Section 4.7 has been revised to clarify the bases for the NRC's radiation dose standards.

Comment: Also, they ignored in the draft the continued pattern of increased radiation-linked diseases. A look at the cancer registry by the former founder and Director of the Massachusetts Cancer Registry and a professor at Boston University has seen a continued increase, elevated levels, of thyroid cancer, leukemia, multiple myeloma, prostate, to name a few. (PNPS-D-Q)

Comment: Additionally, the Massachusetts Cancer Registry for the years 1998 through 2002 shows a continuing increase of leukemia and thyroid cancer around here. No one knows exactly how much radioactive iodine has been and is being released from Pilgrim because there is not adequate monitoring or reporting, we don't know, I mean we do know that large releases were measured in the '70s and '80s but today no one knows what's coming out of the plant. If this plant is relicensed as is, we will never know, the least we should have is adequate real-time monitoring and reporting displayed in all communities as part of the public record. (PNPS-D-K)

Comment: No verifiable health impact has been detected or certified to have resulted from the plant's presence or operations. I'll just add to this our committee had Dr. Sid Nuremberg and the head of nuclear medicine at the hospital, came in with boxes of supporting evidence to say while there were spots of cancer in the town, the type of cancer caused by nuclear radiation is virtually nonpresent. (PNPS-D-L)

Comment: I believe that Pilgrim and the cancer rates in the region are related. (PNPS-D-X)

Comment: By 2032, during the licensing period, the population is expected, one in three, to be over 55, it's one in five now, therefore a more vulnerable population will be in this area. Second, they ignored the radiation-linked diseases that are in this area. The former founder and director of the Mass Cancer Registry has done an analysis, year to year, of cancer statistics in the seven communities that are likely to be impacted which was determined from a state study on health impact. They have seen, every single year, either statistically significant or elevated rates

of leukemia, rates of thyroid cancer until this very day, this was ignored. Also ignored was the fact of elevations in prostate and multiple myeloma from 1999 to '02. Therefore, again, a population that is sensitive. (PNPS-D-D)

Comment: The Massachusetts Cancer Registry also shows, for the years 1998-2002, a continuing increase of leukemia and thyroid cancer in the towns around PNPS. Specifically, there were 83 cases of leukemia reported to the Massachusetts Cancer Registry (MCR), where 72.9 would have been expected based on statewide rates. This results in a Standardized Incidence Ratio (SIR) of 114 (95% conf. int. = 91-143). In addition, there was excess thyroid cancer in these same towns for the same time period. The thyroid cancer SIR was 122 (95% conf. int. = 96-155). In other words, leukemia was 14% elevated over the statewide rate and thyroid cancer was 22% elevated. Neither of these calculations were statistically significantly elevated by the usual convention ($P<.05$), but there were more cases than expected nevertheless. This means there is a continuing excess of these two radiation-related cancers in the population, as there was in the 1980s.

Prostate cancer and multiple myeloma, both radiation-linked diseases, are also elevated and statistically significant for the years 1998-2002 in the seven towns most likely to be impacted near Pilgrim (Carver, Duxbury, Kingston, Marshfield, Pembroke, Plymouth, and Plympton). The seven towns listed are those that a meteorological analysis done by Dr. Spengler and Dr. Keeler for Massachusetts Department of Public Health indicated are most impacted by the sea breeze effect.

These new and significant site-specific studies show that the area is a damaged, sensitive population, and consequently less able to tolerate additional assaults. (PNPS-D-EE)

Comment: I would like to address the issue of Pilgrim's impact on public health, I think the commission has a responsibility to look at site-specific information on this issue. Thyroid cancer and thyroid disease are clearly radiation-linked, radioactive iodine released from reactors is drawn into the thyroid, often resulting in cancer and thyroid disease. Examples of widespread increases in thyroid cancer has occurred in the communities around Chernobyl, and Marshall Islands and Hanford, another example of this type of increase occurred right here near Pilgrim.

As a result of radiation releases in the early and mid '70s and some really big ones in June of 1982, cases of thyroid cancer and leukemia in the surrounding area were significantly elevated. Recognizing the effect of Iodine 131 on the thyroid, the NRC has implemented the Potassium Iodide Program. I have a box in my cellar for my family but I don't need it, since they weren't offering back in 1982 and now I don't have a thyroid anymore. So the draft statement that there have been no health effects here is very incorrect.

In his report to the Southeastern Massachusetts Health Study Review Committee in 1992, Dr. Richard Clapp, former director of the Massachusetts Cancer Registry, presented a graphical assessment showing elevated cases of leukemia and thyroid cancer in the towns closest to Pilgrim during the period of '82 to '89, a second graph depicted the pattern of thyroid cancer in the same set of towns, it shows a peak in the years 1987 and 1988, the year I was diagnosed. These patterns of cancer incidents are consistent with the predicted health effects of the radiation released in the early 1980s.

Since the NRC recognizes the dangers of Iodine 131 to our health and Pilgrim has indeed had a negative impact on public health, this case should require a site-specific review as part of the renewal process. (PNPS-D-K)

Comment: Thyroid cancer and thyroid disease are clearly radiation-linked. Radioactive iodine released from reactors is drawn into the thyroid often resulting in cancer and thyroid disease.

Examples of widespread increases in thyroid cancers occurred in communities around Chernobyl, Marshall Islands, and Hanford.

Another example of this type of increase occurred near Pilgrim. As a result of radiation releases in the early and mid 1970s, and some big ones in June of 1982, cases of thyroid cancer and leukemia in the surrounding area were significantly elevated.

Recognizing the effect of I131 on the thyroid, the NRC implemented the Potassium Iodide (KI) program.

The Draft Statement (SEIS) that there have been no health effects here is very incorrect. In his report to the Southeastern Massachusetts Health Study Review Committee [June 26, 1992] Dr. Richard W. Clapp, former director of the Massachusetts Cancer Registry, presented a graphical assessment showing elevated cases of leukemia and thyroid cancer in the towns closest to Pilgrim during the period 1982-1989. A second graph depicted the pattern of thyroid cancer in the same set of towns. It shows a peak in the years 1987-1988 - the year I was diagnosed. These patterns of cancer incidence are consistent with the predicted health effects of the radiation released in the early 1980s.

Additionally the Massachusetts Cancer Registry for the years 1998-2002, shows a continuing increase of leukemia and thyroid cancer around here.

No one knows exactly how much radioactive iodine has been, and is being released from Pilgrim - Because there is not adequate monitoring and reporting. We do know that large releases were measured in the '70s and '80s but today no one knows what's coming out of

Pilgrim. If this plant is relicensed "as is" we will never know. The least we should have is adequate, real-time monitoring and reporting displayed in all communities as part of the public record.

Since the NRC recognizes the dangers of I131 to our health, and Pilgrim has indeed had a negative impact on public health, this case should require a site-specific review as part of the renewal process. (PNPS-D-Z)

Response: *These comments refer to data from the Massachusetts Cancer Registry and evaluations of data by people such as Dr. Richard Clapp, former Director of the registry, and concluded that the data showed elevated levels of cancer in the towns near PNPS. Section 4.7 of the SEIS addresses Dr. Clapp's evaluations. Section 4.7 discusses the fact that the doses to members of the public are well below NRC and EPA radiation protection standards. Section 4.7 also discusses the large body of evaluations and recommendations from national and international expert groups upon which NRC bases estimates of radiation risk. Finally, Section 4.7 discusses the difference between identifying statistical relationships in health statistics and showing a causal relationship. The information presented by the commenters failed to demonstrate a causal relationship; therefore, the NRC staff's conclusions in Sections 4.3 and 4.7 did not change. Section 4.7 was revised to clarify the basis for NRC's conclusions.*

Comment: They also ignored looking further at the Southeastern Massachusetts Health Study. They didn't ignore it, they simply misrepresented it, which is quite shameful, I might add. The Southeastern Massachusetts Health Study stated, was a study done by the Mass Department of Public Health on adult leukemia and found a, concluded a fourfold increase the closer you lived or if you worked at the reactor. Then there was a re-review, a second peer review panel, politically appointed so that Boston Edison, the then owner, could appoint half the panel and approve the half.

However, the draft says that the NRC considered the relevant information in the re-review -- they didn't use that word -- and concludes that the peer reviews and even the authors now agree that the study does not demonstrate a casual relationship between Pilgrim effluents and the potential effect of cancers in the areas around the state. So, I called the principle author of the study and I said did you talk to them? He said no, I never talked to them, I stand by this study, as did Boston Edison's own peer review panel, hand-picked, that said the results can not be discarded because of methodological weaknesses.

And I said, well, what about the Assistant Commissioner, Suzanne Condon? What did she say? And I have e-mails to this effect, oh, she said the department stands by these studies, this particular study, and then went on further, the association between leukemia and the proximity to Pilgrim was unexpectedly strong and this raised biological plausibility of the study, the study results could not be dismissed. (PNPS-D-D)

Comment: I believe the NRC's EIS minimizes the health risks of radiation releases from the plant. I feel the 1990 DPH publication mischaracterized the study of increased cancer incidences in South Eastern Massachusetts. (PNPS-D-D)

Comment: Mischaracterizing Massachusetts Department of Public Health's Southeastern Massachusetts Health Study (SMHS): SMHS is a case control study that found a four-fold increase in adult leukemia. Boston Edison (BECO), the owner of Pilgrim at the time, cut a political deal which allowed BECO, the implicated industry, to appoint a second peer review panel to re-review the study and write a report. The NRC Staff in the DSEIS misinterpret the second re-review peer group and state in the DSEIS,

…with regard to the SMHS, NRC has considered the relevant information in these citations and concludes that the peer reviews and even the authors now agree that the SMHS does not demonstrate a causal relationship between the PNPS effluents and the potential effect of excess cancers in the areas around the site.

a) The authors of the study [Dr. Robert S. Knorr, Director, Environmental Epidemiology Program Center for Environmental Health, MDPH] never spoke to the NRC staff on this issue ; additionally Suzanne Condon, Associate Commissioner MDPH stated that, "the only conversations she ever had about our study and/or cancer rates with the NRC always emphasized that we continue to stand by our original conclusions."

The author of the SMHS study continued by pointing out that the re-review panel concluded:

The [original SMHS] study team adhered to generally accepted epidemiological principles.." and "the findings of the SMHS cannot be readily dismissed on the basis of methodological errors or proven biases…;" and

The association found between leukemia and proximity to the Pilgrim nuclear facility was unexpectedly strong and, this raised concern regarding the biologic plausibility of the study. …because the study results could not be dismissed, further study may be warranted, including expanding case finding and including children.

The NRC's statement that the MDPH indicated that the findings demonstrated cause and effect is incorrect. The MDPH report specifically states that it is not possible to reach definitive conclusions regarding cause and effect but that the results should be followed up to clarify their public health implications. This conclusion is consistent with that stated by the peer reviewers. While the findings of the study may not support a causal relationship, the NRC arguments in their Supplemental Impact Statement ignore the principal MDPH and peer review conclusions that the findings cannot be dismissed. (PNPS-D-EE)

Comment: The NRC DSEIS concludes that the health impact is and will continue to be small by mischaracterizing the Southeastern Massachusetts Health Study. The DSEIS states that the authors of the Southeastern Massachusetts Health Study have stated that the study shows both a statistical association and a cause and effect relationship between leukemia incidents around the nuclear power plant and exposure to effluents from the plant.

The final report released to the public in October of 1990 found a two to fourfold increase of leukemia among residents of certain towns within a 20 mile radius of the plant, the draft goes on to cite peer reviews from a second re-review peer group that did not support the casual relationship. However, the peer review panel referred to in the draft was appointed by Boston Edison's request, the owner of Pilgrim at the time, and contrary to accepted scientific practice, half of the re-review panel members were appointed by MDPD and the other half by Boston Edison, the company directly impacted and implicated by the study's findings.

In the executive summary of its report though, the second peer review panel concluded that the findings can not be readily dismissed on a basis of methodological errors or proven biases, the association found between leukemia and the proximity to the Pilgrim nuclear facility was unexpectedly strong and this raised concern regarding the biological plausibility of the study. However, because the study's results could not be dismissed, further study may be warranted, including expanding the case finding and including children.

The study noted that Boston Edison admitted higher than average releases in the early days due to poor fuel or damage rods and lack of filtration systems, the study researchers also knew that a number of possible points were not monitored and the monitors on even the main stack did not measure all types of radiation, that significant radiation had been reported in shellfish, milk and vegetation near the plant. The re-review panel member schooled in monitoring was a Boston Edison employee who discounted any unmonitored releases and blamed the too high radiation levels in milk and vegetation on bomb testing in China.

The panel also claimed that if Pilgrim had released significant levels of radiation, it would have been detectable on large numbers of monitors throughout Eastern Massachusetts. However, the Boston Edison appointee was questioned on this and he conceded that, in 1970, there existed only three monitors, one at Pilgrim, another at MIT Cambridge keeping track of MIT's reactor and a third in South Boston keeping tabs on DuPont. These had the same lack of sensitivity as Pilgrim's and were too far away to realistically have been expected to detect Pilgrim's emissions.

The inescapable conclusion is that, both in the 1970s and now, no one really knows how much radiation Pilgrim emitted. The re-review panel effectively admitted as much, suggesting that there should be an independent evaluation of the potential radiation exposure from the Pilgrim plant and from other sources. The study was even more explicit, it recommended that a system

of real-time monitoring and radio nucleotide emissions be implemented so that reliable and timely data are available by which exposure can be assessed more precisely.

The re-review panel's statement in the study's conclusion is contradicted by the fact that the death rates for the study have remained close to the state average exemplifies the how to lie with statistics problem. The re-review panel looked at death rates for Plymouth County as a whole, the Southeastern Mass study found an increased risk in those, to those in a much smaller, more concentrated area likely, within the likely to be impacted geographic area. The re-review panel's executive summary admitted that there have been other reports of observed cancer increases that are inconsistent with predictions based on mathematical modeling and radio biology theory.

In 1990, the Southeastern Mass findings was not based on mathematical models or estimates of radiation releases, rather it was focused on what really happened to real people. The NRC's impact statement ignores the principle Mass Department of Public health and peer review conclusions that the findings can not be dismissed and that further attention to the possible risks associated with the power plant may be warranted, including expanding case findings and including children. (PNPS-D-G)

Comment: The comments provided specifically address section 4.7 ("Evaluation of New and Potentially Significant Information on Impacts of Operation during the Renewal Term), pages 4.65-4.66. This section discusses the Southeastern Massachusetts Health Study (SMHS) that was conducted by the Massachusetts Department of Public (MDPH).

On page 4.66, beginning on line 5 text reads "...with regard to the SMHS, NRC has considered the relevant information in these citations and concludes that the peer reviews and even the authors now agree that the SMHS does not demonstrate a causal relationship between the PNPS effluents and the potential effect of excess cancers in the areas around the site." The MDPH believes this statement is neither a correct summarization of the peer reviews nor the author's published or unpublished opinions. The correct summarization of the second peer review panel would be that:

1. The findings cannot be readily dismissed on the basis of methodological errors or proven biases;

2. The association found between leukemia and proximity to the Pilgrim nuclear facility was unexpectedly strong and, this raised concern regarding the biologic plausibility of the study; and

3.However, because the study results could not be dismissed, further study may be warranted, including expanding case finding and including children. (PNPS-D-II)

Comment: The specific statement in the draft report found on page 4-66, lines 7-8, "the SMHS does not demonstrate a causal relationship between the PNPS effluents and the potential effect of excess cancers in the areas around the site", is specifically not correct for the following reasons. The MDPH report specifically states that it is not possible to reach definitive conclusions regarding cause and effect but that the results should be followed up to clarify their public health implications. This conclusion is consistent with that stated by the peer reviewers. While the findings of the study may not support a causal relationship, the NRC arguments in the Supplemental Impact Statement ignore the principal MDPH and peer review conclusions that the findings cannot be dismissed and that further attention to the possible risks associated with the power plant may be warranted. (PNPS-D-II)

Comment: They also misinterpreted the Southeastern Massachusetts Health Study, the state study that found a fourfold increase in adult leukemia. And I understand they now appreciate that they misquoted or misunderstood and will be going back to DPH, the authors of that study and the assistant commission have held, have stated equivocally, and I will include their e-mails and correspondence in my written testimony, that they stand behind that study. (PNPS-D-Q)

Response: *These comments address the Southeastern Massachusetts Health Study conducted by the Massachusetts Department of Public Health. The study is discussed in Section 4.7 and Section 4.7 has been revised in response to these comments.*

Comment: Background radiation: The NRC staff attempts to minimize the impact of the reported amount of radiation released from Pilgrim by stating it is but a small per-cent of background radiation. They incorrectly claim that, "The average dose of approximately 360 mrem/yr from natural background and medical sources of radiation (NRC 2005)." That number is a national average - not applicable here. The soil in Plymouth and surrounding towns is largely sand containing very little uranium, thorium and radium. We are not Denver, Colorado, for example. (PNPS-D-EE)

Response: *Background radiation levels vary across the U.S. and even from one house to the next and from one person to another. This variation is due to the large range of potential differences in the different components that comprise it. Potential differences include the levels of naturally occurring radioactive materials in the near-surface soils, variations in the construction materials for residences and workplace, differences in elevations, and medical procedures.*

The National Commission on Radiological Protection addresses the difference in the natural radiation background across the U.S. in their NCRP Report Number 94, "Exposure of the Population in the United States and Canada from Natural Background Radiation". This report

presents data summarizing the available information on the levels of natural radiation in the environment, the consequent average exposures, and radiation doses to the population and, wherever possible, the distribution, or at least the variability, of these factors.

NRC uses the average value of the background radiation levels to put doses from the plant's operations in perspective. Although the background varies, it is much larger than the dose resulting from PNPS operations. Section 4.7 has been revised to clarify the statement on background radiation levels.

Comment: With the June 1982 blow out of filters and subsequent radiation releases as an excellent example of "accidental radiation releases" at alarming levels and with horrific varieties of radionuclides - human health effects are inevitable and I would expect to find visible effects of radiation damage to the flora and fauna of the surrounding areas of Pilgrim facility - such as that occurring for the past 28 years around Three Mile Island ... Not only concern for flora and fauna - but for all editables! Thus increasing the risks for concerns. (PNPS-D-PP)

Comment: It is known for example that the following radionuclides have been released from Pilgrim into neighboring communities: plutonium 239 (half life 24,400 years); neptunium 236 or 237 (half life ranging from 120,000years -2.1 million years); cesium 137 (half life 30.2 years); strontium 90 (half life 28.5 years); tritium (half life 12.3 years), and xenon (half life 9.17 hours). Xenon transforms after its emission into cesium 135, which persists almost indefinitely in the environment. Examples of previous releases have been reported in the Annual Radiological Environmental Monitoring Program Reports [REMP].

These releases include substances that will remain active in the local environment for the foreseeable future and should have been taken into account when actual on-going doses to the public are evaluated. (PNPS-D-EE)

Comment: I am also very concerned with any release of radioactive effluent into the environment and need to ask how the dosage suggested on page 140 translates to lamens terms. Also, because this release of radioactive effluents has not changed and "the impact to the environment has not changed," how is this impact determined? How much is too much? How much radioactive effluence is OK? Who makes this determination? (PNPS-D-LL)

Comment: What about the radioactive GASES given off such as XENON 137 which decays into CESIUM 137 (half life of 30 years)? What about water around nuclear reactors where tritium has been absorbed… Tritium is absorbed by living cells and can stay in the body from 1 to 25 years....causing cellular defects such as tumors, retardation, etc. etc. It is also taken up by plants, not just animals like us. You say, perhaps..."Well, there is danger in all forms of energy....." but the danger doesn't persist for centuries! What about XENON 135 that decays into CESIUM 135 (half life - 3 MILLION years)? Etc., etc., etc. Nuclear power is NOT cheap. (PNPS-D-AA)

Response: *There are numerous NRC regulations in place to ensure that the licensees maintain adequate control over radioactive effluents. Most notable are 10 CFR Part 20, Standards for Projection Against Radiation and 10 CFR Part 50, Appendix I, Numerical Guides for Design Objectives and Limiting Conditions for Operations to Meet the Criterion "As Low As Is Reasonably Achievable" (ALARA) for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents. These regulations provide standards and requirements for the control of radioactive materials to limit radiation exposure to occupational workers and members of the public and impacts to the environment. Also, the regulations contain provisions which require the licensee to maintain exposures to the ALARA standards.*

As required by NRC regulations, the amounts of radioactive isotopes released from Pilgrim in liquid and gaseous effluents are constantly monitored and recorded by Entergy. The meteorological conditions at the site also are constantly monitored and recorded. Health physics experts from NRC's Region I office routinely inspect these monitoring programs to ensure that they are being properly implemented. All of this information is fed into calculational models that estimate the amount of radiation dose a member of the public might receive. These models include estimates of dose from internally deposited radioactive isotopes as well as direct radiation exposure. In addition, Entergy conducts an environmental radiological monitoring program in the area around Pilgrim. This program has also been reviewed and approved by the NRC and is inspected by the health physics experts from NRC's Region I office. The environmental radiological monitoring program samples and measures the amount of radioactive isotopes in the air, water, soil, agricultural products, shoreline sediments, and aquatic biota and measures direct radiation from the plant using thermoluminescent dosimeters (TLDs). This program confirms the levels of radioactive isotopes in the environment that are predicted by the computer dose models. This program will also identify any radionuclides that may be accumulating in the environment around Pilgrim. Also, the Massachusetts Department of Public Health conducts an environmental radiological monitoring program around Pilgrim. While Pilgrim may have experienced significant fuel defects and released transuranic radioisotopes earlier in plant operation, NRC believes that the recent effluent reports are the best source of information to help estimate the amount of each type and total amount of radioactive materials that will be released from the plant during the license renewal period.

Chapters 2 and 4 of the SEIS include the staff's assessments of radiological effluents and impacts that are expected during the license renewal period at PNPS. These comments provided no new information. Therefore, no changes have been made to the SEIS.

Comment: Bio-Accumulation of Radionuclides in the Environment from 1972-2032 -ignored

The effects of radiation exposure are cumulative; this is ignored by NRC staff in the Draft. Some types of nuclear power plant emissions stay radioactive for a long time and, because they can enter biological food chains, those materials can accumulate in the environment and

adversely affect public health. "If radioactive emissions persist for years, decades or even centuries within the environment, then even modest reductions in annual discharges may not be sufficient to prevent an environmental build up of those materials over time." Estimates of Environmental Accumulations of radioactivity Resulting from Routine Operation of New England Nuclear Power Plants (1973-84), Dr. Richard W. England,, Mr. Eric Mitchell, p.4, A Report of the Nuclear Emission Research Project, Whittemore School of Business and Economics, University of New Hampshire, Durham, N.H., August 1987. (PNPS-D-EE)

Response: *The Pilgrim Radiological Effluent and Waste Disposal Reports and Radiological Environmental Monitoring Program Reports for 2002-2006 are considered to be representative of facility operations during the renewal period. Any gradual buildup of radioactive materials in soils, sediment, and subsequent incorporation into plants or bioaccumulation in fish or mammals from past and current operations would have been reported in the Environmental Monitoring Program Reports. These data show that all plant operational releases of radionuclides are monitored, releases are below the regulatory limits established for safe operations, and accumulation of radionuclides in environmental media or in the food chain have not been significant. The comment provided no new information. Therefore, no changes have been made to the SEIS.*

Comment: I believe the high levels of mercury in my body are related to Pilgrim. (PNPS-D-X)

Response: *The Commonwealth of Massachusetts does not require PNPS to monitor mercury in any gaseous or liquid effluents. The NRC staff would not expect mercury to be part of the effluents released from PNPS.*

This comment provides no new information; therefore, no changes have been made to the SEIS.

A.2.7 Comments Concerning Socioeconomic Issues

Comment: I can also tell you that the majority of my members that work at that plant live around the plant, which says something. They are proud of what they do there and they feel completely safe with themselves and their family, that is quite a statement. Over 85 percent of them live in Plymouth and Barnstable County. (PNPS-D-O)

Response: *The DSEIS in Section 2.2.8.1 notes the location of Entergy's approximately 700 employees by county and town/city (Table 2-6). As shown in the data provided by Entergy, 80 percent of the PNPS permanent workforce lives in Plymouth or Barnstable counties. This comment provides no new and significant information. Therefore, no changes have been made to the SEIS.*

Comment: Page 2-123, Lines 1-14 - NPS (Entergy) should be listed as one of the largest employers. With over 700 employees, it would be the second largest employer in Plymouth per the numbers listed in this section. (PNPS-D-MM)

Response: *The DSEIS, in Section 2.2.8.1 notes the location of Entergy's approximately 700 employees by county and town/city. Section 2.2.8.6.1 further discusses employment in the Plymouth area citing Old Colony Planning Council data. The text in Section 2.2.8.6.1 has been changed to specifically note that Entergy is one of the town's largest employers.*

Comment: Speaking of work, Pilgrim is also an important source of jobs, it has more than 700 permanent full-time employees, most of whom live in Plymouth and the surrounding communities, indeed Pilgrim supports the local economy to the tune of $135 million in local economic activity. Though the draft environmental impact statement noted a moderate socioeconomic impact should the plant cease operations, we believe those who would lose their jobs would face a large economic and financial loss. (PNPS-D-E, PNPS-D-P)

Comment: I think we need to keep our children near us in Massachusetts, our grandchildren near us, and we now are dealing with the slow down, if you will, on the redevelopment of power plants. I am concerned about the workers who do work at the plant, we do have 400 or 500 families, I would be very sorry to see them go. (PNPS-D-V)

Response: *The DSEIS, in Section 8.1.8 notes that closure of PNPS would have Moderate socioeconomic impacts. This statement does not deny that direct and indirect effects to employees, etc. could be Large; rather, the statement attempts to place the potential consequences of closure within the context of the regional economy. In the context of projected employment in Plymouth town in 2010 (Old Colony Planning Council [OCPC], Comprehensive Economic Development Strategy: Keeping Our Region Competitive, 2006), the loss of 700 employees would represent 3.4 percent of employment in the town, or 0.5 percent in the larger OCPC region. Moreover, OCPC projects employment growth in both the region and the town will exceed 19 percent over the period 2000-2025. In this context the direct loss of the PNPS employment is likely to be moderate and relatively temporary in the context of the region's anticipated growth. These comments provide no new and significant information. Therefore, no changes have been made to the SEIS.*

Comment: Page 2-124, Lines 32-33 - Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth which was signed on March 5, 2002 and became effective for FY 2003, not 2007 as stated. It is NSTAR which has payments of $1 million which begin in 2007, not Entergy. Refer to 2nd paragraph of Section 2.7 in the PNPS Environmental Report. (PNPS-D-MM)

Comment: Page 2-124, Lines 3 and 23-24 - Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth. (PNPS-D-MM)

Response: *The text in Section 2.2.8.6.3 has been changed to more accurately reflect the Entergy PILOT arrangement with the Town of Plymouth (ADAMS Accession No. ML063260173).*

Comment: The collusion between member corporations of the nuclear industry, their lobbying arm NEI, and members of the United States government have in fact and deed negatively impacted upon the quality of this comment filers life, negatively impacted the true value of real estate value of statement filer, and put said filer in a situation of grave financial risk should a nuclear incident occur at any nuclear facility in America, as a result of the wrongful passage of, and extension of the Price Anderson Act that limits the financial liability of the owners of Nuclear Power Reactors here in America. (PNPS-D-A)

Comment: Further, said application, and subsequent Draft EIS rely upon out dated and no longer accurate data and assumptions, since the human inhabitation within the area of impact surrounding the Pilgrim Nuclear Power Plant has dramatically changed since the original grant of license for said facility. (PNPS-D-A)

Comment: I believe there will be more investment in Plymouth, if Pilgrim is stopped. (PNPS-D-X)

Response: *The DSEIS provides current socioeconomic data in Section 2.2.8, including data on housing, public services, land use, demography, and the economy. Investment in the Plymouth area may be gauged by the recent growth of population, housing and jobs. The US Census reports a population growth of 8.6 percent in Plymouth county in the 1990s and 19.9 percent in Barnstable county; these rates of growth substantially exceed the 5.5 percent in the state as a whole during this period. Similarly, occupied housing units increased in Plymouth by 12.6 percent and in Barnstable by 22.2 percent, compared to the state's growth of 8.7 percent. Growth of employment reported by Old Colony Planning Council (OCPC) for Plymouth town over the 1990s was 18.6 percent, and in the OCPC region was 11.4 percent (Old Colony Planning Council, Comprehensive Economic Development Strategy: Keeping Our Region Competitive, 2006). This compares to a growth of 4.4 percent for the state as a whole over the same period. Moreover, projections for employment in the OCPC region are strong, with a projected 19.3 percent growth for Plymouth over 2000-2025 and 19.8 percent for the OCPC region. In terms of value of housing, median house values in Plymouth county increased by 14.9 percent over 1990-2000, compared to the state's 14.5 percent. Thus, there is no evidence to support the assertion that PNPS has depressed growth and/or values in its region over the past decade or more. These comments provide no new and significant information. Therefore, no changes have been made to the SEIS.*

A.2.8 Comments Concerning Land Use Issues

Comment: Page 4-51, Line 8 - Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth which was signed on March 5, 2002 and became effective for FY 2003, not 2007 as stated. It is NST AR which has payments of $1 million which begin in 2007, not Entergy. Refer to 2nd paragraph of Section 2.7 in the PNPS Environmental Report. (PNPS-D-MM)

Comment: Page 4-51, Lines 15-17 - NSTAR payments are not payments made by PNPS, but are as the result of deregulation. (PNPS-D-MM)

Comment: Page 2-20, Lines 31-32; Page 4-51, Line 1 - Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth. (PNPS-D-MM)

Response: *The text has been changed to more accurately reflect the Entergy PILOT arrangement with the Town of Plymouth. (See ADAMS Accession No. ML063260173)*

Comment: Page 2-128, Line 29; Page 2-129, Lines 5 and 9; Page 4-52, Line 34 - The "recreation area" has been closed to the public since shortly after 9/11/2001 but limited use is allowed to employees of PNPS. It is no longer referred to as a nature area and the trails, etc. are not currently maintained as a recreation area. (PNPS-D-MM)

Comment: Page 2-4, Lines 12-14 - The "nature area" has been closed to the public since shortly after 9/11/2001 but limited use is allowed to employees of PNPS. It is no longer referred to as a nature area and the trails, etc. are not currently maintained as a nature area. (PNPS-D-MM)

Response: *The text in Sections 2.1.1, 2.2.9.2.2, 2.2.9.2.3, and 4.4.5.1 has been modified to reflect the changes in the use of the "natural area" and "recreation area".*

Comment: Page 2-21, Lines 27-28 - This should also state that PNPS received certification from the Commonwealth of Massachusetts Office of Coastal Zone Management (letter dated 7/11/06), instead of only that the certification was filed. (PNPS-D-MM)

Response: *Section 2.2.1 has been modified to reflect receipt of certification from the Massachusetts Office of Coastal Zone Management (ADAMS Accession No. ML062090362). Also, a copy of this letter can be found in Appendix E of this SEIS.*

Comment: I am writing to request that part of the negotiations between Entergy and the Town of Plymouth include the preservation of the Entergy land so that - for safety reasons - no more development will take place near the plant.

The approximately 1600 acres of land now owned by Entergy has been preserved by the owners of Pilgrim Nuclear Power Plant since it received its license in 1972. I would suggest that continued preservation of the land be formalized into a Conservation Restriction as part of the re-licensing negotiations.

850 people living just a few miles from the nuclear plant. For safety and evacuation reasons the 1600 acres Entergy owns should remain as open space. (PNPS-D-B)

Comment: When Pilgrim was licensed and built in 1972, its location was in an area that was remote and undeveloped. At the project planning stage, the initial site chosen by Boston Edison at the Quincy Naval Air Station was rejected because the area was too heavily populated. The ultimate site in Plymouth was chosen because it was a sparsely populated area.

However, the population around the plant has changed drastically in the last 30 years, and this aging plant is now located in the fastest growing region in Massachusetts. In Pilgrim's backyard, Pinehills, the largest housing development in New England, is under construction. The build-out includes 2,877 homes on 3,060 acres, and Pinehills is actively trying to acquire more land to build in this area. The distance from Pilgrim to Pinehills is about 3 ½ miles. The current Pinehills household size is 1.95 people per building. Based on these numbers, there will soon be 5,850 people living just a few miles from the nuclear plant. For safety and evacuation reasons the 1600 acres Entergy owns should remain as open space. (PNPS-D-B)

Response: *As discussed in Section 2.2.1 of the DSEIS, the majority of the over 1530 ac undeveloped tract owned by Entergy has been placed in a forest land trust under Chapter 61 of the General Laws of Massachusetts, Classification and Taxation of Forest Lands and Forest Products. Any arrangements to preserve the land in its current state are a matter between Entergy and the Town of Plymouth, and not within the purview of this SEIS. However, as part of the new PILOT agreement Entergy has agreed to continue to protect this undeveloped tract (ADAMS Accession No. ML063260173). These comments provide no new and significant information. Therefore, no changes have been made to the SEIS.*

Comment: Page 2-21, Lines 13-14 and Page 2-92, Lines 16, 18-19 - There are contradictory statements regarding the transmission ROW (right of way) crossing state parks, etc. Page 2-21 (lines 13-14) indicates the ROW is within the Myles Standish State Forest while Page 2-92 (line 16) indicates the ROW "does not cross any state or federal parks" and lines 18-19 (Page 2-92) has the same wording as Page 2-21 (lines 13-14). (PNPS-D-MM)

Response: *The statements are not contradictory. Miles Standish State Forest is not a state park. State forests and state parks are separate entities and generally are not managed for the same uses. The comment provides no new and significant information. Therefore, no changes have been made to the SEIS.*

A.2.9 Comments Concerning Postulated Accidents

Comment: NRC's DSEIS is inadequate in that the NRC staff mistakenly concluded the Applicant's SAMA Analysis was "sound." The SAMA analysis was faulty in that Entergy entered partial and selective data into the model and thereby underestimated consequences to make mitigation alternatives, such as the Direct Torus Vent System, appear not cost effective The purpose of a SAMA review is to ensure that any plant changes that have a potential for significantly improving severe accident safety performance are properly analyzed identified and addressed. One example of how a poorly performed SAMA analysis can lead to erroneous conclusions is the Pilgrim Environmental Report's look at the costs and benefits of installing a Direct Torus Vent filter at Pilgrim.

The Direct Torus Vent System (DTVS) is a method to relieve the high pressure which is generated during a severe accident.

In 1986, it was determined that the Mark I containment, especially being smaller with lower design pressure, in spite of the suppression pool, has a 90% probability of that containment failing. The purpose of the containment is to provide a barrier between the lethal radiation inside the reactor and the public. In order to protect the Mark I containment from a total rupture it was determined necessary to vent high pressure buildup. As a result, the "Direct Torus Vent System" at all Mark I reactors, including Pilgrim, was installed. Operated from the control room, the vent is a reinforced pipe installed in the torus and designed to release radioactive high pressure steam generated in a severe accident by allowing the unfiltered release directly to the atmosphere through the 300 foot vent stack. Use of the vent discharges steam and radioactive material directly to the atmosphere bypassing the standby gas treatment system (SBGTS) filters normally used to process releases via the containment ventilation pathway. There is no radiation monitor on the pipe and valves that comprise the DTV line. Operators now have the option by direct action to expose the public and the environment to unknown amounts of harmful radiation.

As a result of Pilgrim's design deficiency, the original idea for a passive containment system has been dangerously compromised and given over to human control with all its associated risks of error and technical failure.

There appears to be an internal contradiction in what we are being told. "The NRC believes that the release from a severe core-melt accident would be reduced [by the suppression pool] by a factor of one hundred. This is considerably more optimistic than estimated in the NRC's first study on the subject. Also, the contention is that the reduction by a filtration system would have zero benefit. Here the contenders seem to be assuming that a factor of one hundred equals 100%. That is false. Even a release of 1 percent of the core's radioactive iodine and cesium would be a very severe event.

In its Environmental Report, Entergy analyzes the benefits of installing a filter to the torus vent in the course of reviewing possible severe accident mitigation alternatives.

Their Report states, this analysis case was used to evaluate the change in plant risk from installing a filtered containment vent to provide fission product scrubbing. A bounding analysis was performed by reducing the successful torus venting accident progression source terms by a factor of 2 to reflect the additional filtered capability. Reducing the releases from the vent path resulted in no benefit." The Report then states, "Basis for Conclusion: Successful torus venting accident progressions source terms are reduced by a factor of 2 to reflect the additional filtered capability. The cost of implementing SAMA at Peach Bottom was estimated to be $3 million. Therefore this SAMA is not cost effective for [Pilgrim]." Entergy has determined that in return for a cost of $3 million, there will be no benefit to public health and safety.

How it is possible to find zero benefit from installing a filter that would reduce by a factor of two the radioactive venting to the public in the case of a severe accident?

Unfiltered venting has been judged unsafe by all regulatory agencies outside the United States. In its analysis of several risk contributors to Core Damage Frequency, the disposition of those events frequently included "venting via DTV path to reduce containment pressure." In other words, a filter in the torus vent could reduce the impact in many possible severe accidents. The only conclusion to draw from the outcome of the DTV filter SAMA analysis is that, Entergy has used the MACCS2 code to downplay the health and economic costs of severe accidents and used the Probabilistic Safety Analysis (PSA) model to make the benefits of mitigation appear to be zero.

NRC staff reviewed Entergy's analysis and concluded that the methods used and implementation of those methods was sound. And "the costs of SAMAs evaluated would be higher than the associated benefits. 5.2.5. The NRC staff is wrong to accept Entergy's SAMA analysis in the application. The SAMA analysis included in the Pilgrim Environmental Report is incomplete.

Not only does the probabilistic modeling for severe accidents artificially make consequences appear insignificant, but the Applicant has used incomplete and incorrect input parameters into the MACCS2 code.

The direct torus vent filter as an example of how this cost benefit equation might have been skewed in favor of no mitigation "While NEPA does not require agencies to select particular options, it is intended to 'foster both informed decision-making and informed public participation, and thus to ensure the agency does not act upon incomplete information, only to regret its decision after it is too late to correct' It then said "if 'further analysis' is called for, that in itself is

a valid and meaningful remedy under NEPA." The Applicant has drastically under counted the costs of a severe accident, and this could have led it to erroneously reject mitigation alternatives. Further analysis is called for.

EPA has acceptable standards for exposure, in the real world; there is no safe level of exposure to radiation.

In conclusion, the danger of NRC rubber stamping Entergy's SAMA in the DSEIS - accepting the licensee's minimization of consequences that make the cost of adding a filter to the Direct Torus Vent seem unnecessarily high/ not cost effective when it is obvious that the mitigation of installing the filter could indeed serve to protect public health and safety. I repeat, unfiltered venting has been judged unsafe by all regulatory agencies outside the United States. (PNPS-D-CC)

Comment: The applicant has drastically undercounted the cost of severe accident and this could have led it to erroneously reject mitigation alternatives, further analysis if called for. The EPA has acceptable standards for exposure, in the real world there is no safe level of exposure to radiation.

In conclusion, the danger of NRC rubber stamping the Entergy's SAMA in the DSEIS, accepting the licensee's minimization of consequences that make the cost of adding a filter to the direct torus vent seem unnecessarily high or not cost effective when it is obvious that the mitigation of installing the filter could indeed serve to protect the public health and safety, I repeat unfiltered venting has been judged unsafe by all regulatory agencies outside of the United States. (PNPS-D-F)

Comment: My second comment is on the DSEIS, that the NRC staff mistakenly concluded that the applicant's SAMA analysis was sound, that the faulty SAMA analysis used by Entergy in the environmental report caused it to wrongly dismiss mitigation alternatives such as adding a filter to the direct torus vent. The purpose of a SAMA review is to ensure that any plant changes that have a potential for significantly improving severe accident safety performance are identified and addressed, one example of how a poorly performed SAMA analysis can lead to erroneous conclusions is the Pilgrim environmental reports look at the cost and benefits of installing a direct torus vent filter at Pilgrim.

The direct torus vent system is a method to relieve high pressure which is generated during an accident review, severe accident, excuse me. In 1986 it was determined that the Mark I containment, especially being smaller with lower design pressure, in spite of a suppression pool, has a 90 percent probability of that containment failing. The purpose of the containment is to provide a barrier between the lethal radiation inside the reactor and the public. In order to

protect the Mark I containment from total rupture, it was determined necessary to vent high pressure build-up. As a result, the direct torus vent system to all Mark I reactors, including Pilgrim, was installed.

Operated from the control room, the vent is a reinforced pipe installed in the torus and designed to release radioactive high pressure steam generated in a severe accident by allowing the unfiltered releases directly to the atmosphere through a 300-foot vent stack. Use of the vent discharges steam and radioactive material directly into the atmosphere, bypassing the standby gas treatment system filters normally used to process releases via the containment ventilation pathway. There is no radiation monitor on the pipe and valves that compromise the direct torus vent line and operators now have the option to direct action to expose the public and the environment to unknown amounts of harmful radiation.

As a result of Pilgrim's design deficiency, the original idea for a passive containment system has been dangerously compromised and given over to human control with all its associated risks of error and technical failure. There appears to be an internal contradiction in what we are being told, the NRC believes that the release from a severe core melt accident would be reduced by a factor of 100, this is considerably more optimistic than estimated in the NRC's first study on the subject.

As the contention is that the reduction of a filtration system would have zero benefit, here the contenders seem to be assuming that a factor of 100 equals 100 percent and that's false, even a release of 1 percent of the core's radioactive iodine and cesium would be a very severe event.

In its environmental report, Entergy analyzes the benefits on installing a filter to the torus vent in the course of reviewing possible severe accident mitigation alternatives, their report states this analysis case was used to evaluate the change in plant risk from installing a filtered containment vent to provide fission product scrubbing. A bounding analysis was performed by reducing the successful torus venting accident progression source terms by a factor of two to reflect the additional filtered capacity and capability.

Reducing the releases from the vent path resulted in no benefit, according to the state report, the basis for conclusion that successful torus venting accident progression source terms are reduced by a factor of two to reflect the additional filtered capability, the cost of implementing SAMA at Peach Bottom was estimated a $3 million. Therefore, this SAMA is not cost effective

for Pilgrim. Entergy has determined that, in return for a cost of $3 million, there will be no benefit to public health or safety.

How is it possible to find zero benefit from installing a filter that would reduce by a factor of two the radioactive venting to the public in a case of a severe accident? Unfiltered venting has been judged unsafe by all regulatory agencies outside the United States. In its analysis of several risk

contributors to core damage frequency, the disposition of those events frequently included venting via the direct torus vent path to reduce containment pressure. In other words, a filter in the torus vent would reduce the impact in many possible severe accidents.

The only conclusion to draw from the outcome of the direct torus vent filter SAMA analysis is that Entergy has used the MACCS II code to downplay the health and economic cost of severe accidents and use the probabilistic safety analysis model to make the benefits of mitigation appear to be zero. NRC staff reviewed Entergy's analysis and concluded that the methods used in the implementation of those methods were sound, the costs of SAMA's evaluation would be higher than the associated benefits in 2.2, in 5.2.5. The NRC staff is wrong to accept Entergy's SAMA analysis in this application.

The SAMA analysis included in the Pilgrim environmental report is incomplete, not only does the probabilistic modeling for severe accidents artificially make consequences appear insignificant but the application has used incomplete and incorrect input parameters to the MACCS II code. The direct or torus vent filter is an example of how this cost/benefit equation might have been skewed in favor of no mitigation. (PNPS-D-F)

Comment: The faulty SAMA analysis used by Entergy in the Environmental Report, and accepted by NRC in the DSEIS, caused it to wrongly dismiss mitigation alternatives such as adding a filter to the Direct Torus Vent. (PNPS-D-EE)

Comment: And so because of the problems with the severe accident mitigation analysis, what it does is falsely minimize consequences so the cost of mitigation seems not necessary, as described for the direct torus vent system, and we could go through many other mitigations that should be relooked at, but the key is you have to do an honest analysis to begin with, which was never done. (PNPS-D-M)

Response: *The NRC staff review of the SAMAs for PNPS is described in detail in Appendix G of the SEIS. The scope of the review specifically included the risk and economic impacts of severe accidents at PNPS given the existing plant configuration, the estimated effectiveness of each candidate SAMA in reducing risk and economic impacts (i.e., the estimated benefits), and the estimated implementation cost for each SAMA. As a result of the staff's review, numerous portions of the licensee's analysis were revised and/or supplemented, and several additional potentially cost-beneficial SAMAs were identified.*

The addition of a filtered vent was incorrectly reported in the ER to have zero benefit. This error was subsequently identified and a revised analysis was included in Amendment 4 to the LRA (ADAMS Accession No. ML061930418). The analysis indicates that this improvement has no impact on core damage frequency but could reduce off-site dose by about 20 percent. (The dose reduction is limited due to the fact that the gases entering the filter would have already been passed through and been scrubbed by the suppression pool, and that some containment

failure modes, such as containment liner melt-through, would bypass the filter.) The estimated implementation costs are substantially greater than the estimated dollar benefit. Thus, this improvement is not cost-beneficial. The comments do not provide any new and significant information. Therefore, no changes have been made to the SEIS.

Comment: "The Commission has determined that impacts of DBAs are small significance for all plants because the plants were designed to successfully withstand these accidents."

NRC staff obviously forgot about the near-miss at Davis Besse NPS - the reactor with a hole in its head. NRC staff incorrectly assumes that: NRC regulations are sufficiently stringent; that regulations are followed by licensees and manufacturers; and that there is sufficient NRC oversight and enforcement action when regulations are not met.

What was not taken into account?

- Spent fuel pool accident can cause/lead to a reactor core accident and vice versa -the interplay was ignored and not analyzed;
- Human error;
- The effects of an aging work force;
- The bathtub curve of aging - trouble occurs in all mechanical components in their early and later stages - Pilgrim will be in the "late stage" from 2012-2032;
- The use of counterfeit and substandard parts;
- The potential leakage of contaminated water offsite;
- The Aging Management Plan failure to adequately monitor for corrosion in the drywell liner;
- Wiring Coating- missing from the list of passive equipment is testing /re-qualifying the EQ rating, although the miles of wiring at Pilgrim is tested with the active components they interconnect -these wires are required to perform under harsh conditions (fire, high temperature, and high moisture). As the wiring ages its ability to still meet the original qualification tests is an interesting, though overlooked, challenge. A good comparison, consider what is happen in the City of Boston. The aging Nstar electric system is failing. How many of those failures are just old wires with rubber coating turned brittle and cracked? The power flows until the manhole explodes. Turing on a pump is like turning on your lights; it does not test the wiring coating, the EQ, only the metal of the wire.

Engineering Review of Operating Transients: Pilgrim in 1994 had already exceeded the 40-year design standards for 6 kinds of events that put stress on the reactor before license expiration, according to a February 24, 1994 NRC Inspection Report -we are considering adding an additional 20 years.

Transient Description	Design Cycles 40 years	Cycles to-date 21 years	Projected Cycles 40 years
Startup	120	187	368
Power Increase	120	133	264
T/G Trips	40	26	49
Other Scrams	147	134	346
Loss of FW Pumps	10	26	64
SR Valve Blowdown	2	13	23

- Replacement parts – difficult, if not impossible, to find from 2012-2032

Example - The Patriot Ledger Reported, February 25, 2003, Broken pump shuts Pilgrim power plant - Engineers traced the pump problem to a defective part in the generator that powers the pump motor, Tarantino said. A 12-inch-wide "slip ring" in the motor and generator had failed… The motor and generator together are about the size of an automobile… Workers are replacing the rotor in the generator… It took until Sunday to get the part because Pilgrim "was built in the 1960s and went on line in 1972," Tarantino said. "In some cases it's becoming difficult to find replacement parts because the technology has changed."

Replacement parts in a global economy can come from anywhere in the world. This presents serious QA issues, not analyzed. (PNPS-D-EE)

Response: *The license renewal review assumed the safety design basis of the plant will be maintained and the plant will continue to meet all NRC regulations. Therefore, NRC's license renewal review does not re-exam the design basis of the plant. The license renewal safety review focuses on programs to manage aging. Safety matters related to aging are addressed as a part of the NRC safety review for the license renewal, which is conducted separately, and is documented in an NRC staff Safety Evaluation Report. However, the NRC routinely searches for and examines new information that could affect the safety design basis of nuclear power plants including information to determine if changes in the design basis are needed generically or for an individual plant. If any revisions to the design basis for PNPS are determined to be necessary, those revisions would become part of the PNPS design basis during the license renewal period. The comment provides no new and significant information. Therefore, no changes were made to the SEIS.*

Comment: The applicant is required to analyze severe accident mitigation alternatives. The NRC staff concluded in their review of Entergy's analysis that the methods were sound and, although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this

area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits by a factor of five to account for potential benefits in external events.

Question: Where did "5" come from; what is the rational, none is given; what should it have been? Five is obviously pulled out of the air. It assumes that there is no difference between events caused externally than internally - there is no rational basis for that assumption. Consequences of NRC rubber-stamping the faulty SAMA Analysis (PNPS-D-EE)

Response: *A candidate SAMA could reduce the risk from both internal and external events, even though the SAMA may have been identified based on consideration of internal events. SAMA benefits in internal events are determined by quantifying the internal events PRA with and without credit for the SAMA. However, when external event risk has been assessed using screening methods (e.g., fire screening or seismic margins approaches) rather than a probabilistic risk assessment (i.e., fire and seismic PRAs), direct quantification of the SAMA benefits in external events is not practical. In such cases, and in the case of PNPS, a simplified approach has been taken in which the estimated internal events benefits for the SAMA are multiplied by a factor representing relative contribution of internal events and external events to the total core damage frequency for the plant. This implicitly assumes that each SAMA would offer the same percentage risk reduction in external events as it offers in internal events. The basis for the factor of 5 multiplier used to account for potential SAMA benefits in external events at PNPS is described in Section G.2.2 of Appendix G to the SEIS. This comment provides no new and significant information. Therefore, no changes have been made to the SEIS.*

Comment: "The staff reviewed Entergy's analysis and concluded that the methods used and implementation of those methods was sound." And "the costs of SAMAs evaluated would be higher than the associated benefits. The NRC staff is wrong to accept Entergy's SAMA analysis in the application - see Pilgrim Watch's Motion to Intervene, Contention 3.

Criticism: The Applicant's Environmental Report inadequately accounts for off-site health exposure and economic costs in its SAMA analysis of severe accidents. By using probabilistic modeling and incorrectly inputting certain parameters into the modeling software [such as meteorology, demographic data, economic data, emergency response data], Entergy has downplayed the consequences of a severe accident at Pilgrim and this has caused it to draw incorrect conclusions about the costs versus benefits of possible mitigation alternatives.

Examples: Economic data - Nowhere in the assessment of the economic costs of a severe accident does the model account for the loss of economic activity in Plymouth County. The valuations include only the assessed value of the property, ignoring business value. The fact that the building is an on-going business with inventory, equipment, and income generation capability is not taken into account. Tourism is ignored which is mystifying because the staff looked into and mentions historic and archaeological resources as a variable in their alternative analysis, section 8, and description of the site (section 2.2.9).

Evacuation Delay time: Entergy assumes that the longest likely delay before residents begin to evacuate is 2 hours. This assumption is incorrect for the simple reason that notice of the evacuation could take longer than 2 hours to reach people. The sirens only can be heard outside, if an accident occurs when residents are inside, during the night for instance, they are unlikely to be notified within 2 hours. The peak population in the EPZ approximates 100,000. How is it conceivably possible to spread the word if the sirens are down over approximately 150 square miles when the public is engaged in a variety of activities? What about those who can not hear the sirens inside?

Evacuation Speed: Entergy assumes the evacuation speed will be from 3 hours 35 minutes to 6 hours 30 minutes However, to arrive at this number, the applicant falsely assumes that: the public is out of danger once they cross the 10 mile boundary but in a severe accident harmful levels of radiation (and thus evacuation) will extend beyond 10 miles; they assume no one beyond 10 miles will evacuate, leaving roads clear when we know the "shadow evacuation" will occur and a "cork will effectively be placed in the bottle" trapping those near the core; and they assume transportation providers from well outside the zone will come and whisk folks away within this small frame-period. How did the NRC staff buy into this? (PNPS-D-EE)

Comment: This moves into the severe accident mitigation analysis which the draft decided was, the analysis was sound which, again, if you really looked at it, you could not come up with that conclusion and I hope they will look at it more seriously again. The licensee, the applicant, used the MACCS II code, they are not restricted, by the way, of only using that code, but what is important is what goes in, what are the variables, the input data, because obviously that would effect the analysis of what the consequences are and the input data clearly is lacking. (PNPS-D-M)

Comment: Evacuation speed, again, a very unrealistic time was put into the formula because it had faulty emergency planning assumptions, they overlooked, for example, the shadow evacuation. There is an assumption that everybody outside whatever the zone is going to stay home and go about their business, we know, from Three Mile Island, we know from telephone surveys that were done after that people outside the ten miles, people close to Boston will be hitting the road, putting a cork, so to speak, in the bottle, so that people here are not going to be able to get out in the timely manner that was assumed. (PNPS-D-M)

Comment: Not also considered properly were two emergency planning variables, one, evacuation delay time which is, in English, notification. They stated that the public would be notified, at max, within six hours, that makes assumptions which aren't true, that sirens can be heard inside the houses, which they can not be heard inside. What about an accident happening at night? What about the fact that some sirens are not going to operate? You cannot expect part of the fire or police department and DPW to cover over 125 square miles to notify people who are doing different things, clearly this is just, that people will be ready to get out of here in six hours is unrealistic. (PNPS-D-M)

Comment: We also know that there is nothing magic about the ten miles, so the evacuation speed is how long it's going to take to get from, let's say, my house in Duxbury to just a little bit past the magic ten miles in Marshfield. Again, we know from the Sandia National Labs studies, we know from study, after study, after study that there is nothing magic about the ten miles so to assume the consequences end at that point and we can call an evacuation successful once you cross the ten miles is patently absurd. (PNPS-D-M)

Comment: For economic data, they put in the average property value of farm and non-farm property, they did not look at, for example, the added value of an ongoing business enterprise, clearly a manufacturing plant is valued at far more than the bricks and mortar that go into it. In doing an analysis of alternative sources of energy, there was an analysis of historic, you know, value of the area and what the impact would be, but it is not in the SAMA analysis for Pilgrim. Clearly because this area has such great historic value, also clearly because of our beautiful seaside location, that impacts and raises the values of our property. Tourism is here because, not to come to these meetings, obviously, but because of the history that's here, because of the seaside location and that would be gone and has to be factored in. (PNPS-D-M)

Comment: Now I know some of the commenters had referred to, and I'm not going to get too technically jargonny here, but Class A and Class B air quality dispersion models, and these are modeling concepts that the NRC developed back in the `70s and `80s time frame. I'll just say that the MACCS II code is more like a Class A model, very simplistic, assumes straight winds, any given hour, and can be applied pretty quickly, and the Class type B models were never really fully implemented for use because they are quite cumbersome, expensive numerical models, needed a mainframe computer probably about half the size of this room.

The good news is that, since the early 1980s, that modeling techniques have been advanced and models are a little simpler to apply, you can use some of these complex models now, variable trajectory wind flow models on a PC. An example of these types of models can be found in 40CFR, Part 51, Appendix W, that's the OCPA's guideline and air quality models, and an example of a model that can be found there is the Cal-Puf model which can be applied for shoreline complex wind flow environments, such as those that exist in the Pilgrim region.

And I realize this is not part of nuclear emergency preparedness planning, in terms of the relicensing, but those kinds of models can also be applied and adapted for use for operational studies and accident analysis studies, including the SAMA type of studies too. And I brought up that model in particular because the NRC's contract, Earth Tech, was the, some of my colleagues who had worked at Earth Tech were involved with the development of that Cal-Puf model, so I know the folks from Earth Tech know what I'm talking about here. (PNPS-D-U)

Comment: I'm going to limit my comments tonight briefly just to the adequacy of meteorological databases and models that were used for the off-site consequence analysis that was discussed in Chapter 5 of the supplement EIS. You'll note that in the appendices, that Appendix A, I believe, that contained comments from the scoping meeting, public scoping meeting, that took place last summer, there were a number of questions and issues raised about the adequacy of the MACCS II software code that was used for doing the air quality analyses, meteorological analyses for use in the studies.

And I guess the response to those comments indicated that this would be addressed or discussed in Chapter 5, although I didn't see any simple or extensive discussion in Chapter 5, it just gave the results, so I would like to see Chapter 5 or somewhere in the appendices in the SEIS give a more in depth discussion of justifying the use of that type of code for purposes of the modeling and dose calculations for the off-site consequence analysis that went into the cost/benefit studies. (PNPS-D-U)

Comment: Pilgrim's monitoring reports and dose calculation models are neither reliable nor accurate. Example: dose calculation models assume that a radioactive plume will move in a straight line when, in fact, wind in our coastal communities is highly variable affected by the sea breeze effect, topography, and buildings. Wind direction is measured by the meteorological tower on the reactor building. It only tells where the wind in blowing on site not what happens to it offsite. There are no real-time weather and radiation monitors appropriately placed in surrounding communities to measure alpha, beta and gamma radiation. Environmental sampling for radiation in the environment is limited; and the samples are analyzed and reports prepared by Entergy's own laboratory. (PNPS-D-EE)

Comment: I'd just like to close to say that I would like to see NRC come up to speed, such as other federal agencies have had in the last decade or so, and use realistic, accurate modeling techniques for a number of different applications. And I think the sooner this is done, the more credible and realistic the analyses will be and that will only help promote and advance perhaps the advent of even newer reactor technologies down the road, so things don't get delayed due to questionable analyses. (PNPS-D-U)

Response: *Section G.2.3 has been added in response to these comments.*

A.2.10 Comments Concerning Uranium Fuel Cycle and Waste Management Issues

Comment: Page 2-12, Lines 19-20 - Fission products are not "normally" released from the fuel rods. However, on rare occasions, a small defect in a fuel rod can occur which allows small amounts of fission products to be released to the reactor coolant. (PNPS-D-MM)

Response: *Minor quantities of fission products are released from fuel rods to the reactor coolant during reactor operation. The fission products are captured and removed by various liquid and gaseous radwaste processing systems and become part of the radwaste stream that must be managed for proper handling and disposal. Consequently, only a small fraction of the fission products that enter the reactor coolant are actually available for release to the environment. Given the capture and processing of fission products by in-plant systems, many reactor facilities are able to operate, under normal circumstances, in a mode that results in essentially zero environmental release of liquid borne fission products and inconsequential levels of gaseous fission products. Monitoring of plant operations enables regulatory agencies and plant operators to determine if environmental releases are occurring and to assess the magnitude and implications of the releases should they be observed.*

The specific text referred to by the commenter actually states that "… under normal operating procedures …" This statement was not intended to suggest that radioactivce products are "normally" released from the fuel rods. This comment provides no new and significant information. Therefore, no changes have been made to the SEIS.

Comment: I presume there will have to be a complete failure of a containment pond before the NRC and in particular Congress provides a permanent depository for the spent rods as promised 40 years ago. (PNPS-D-Y)

Comment: The tailings from mines, the water and chemicals used, spent rods etc., etc..... are all dangerously radioactive. Where does the radioactive waste go? To Bangkok? To Sri Lanka? To the bottom of the ocean? Who transports it, who pays them? Nuclear power is NOT cheap! (PNPS-D-AA)

Comment: EVERY 1000 megawatt nuclear power plant produces 30 TONS OF RADIOACTICVE WASTER PER YEAR. Does Pilgrim Nuclear use dry storage casks? cooling pools? They're still "tight" and "safe"? For how long? and then what? Are the trucks or ships or railroads and proper containers now being designed and built to move the radioactive wastes to _____(wherever) .....did you say YUCCA Mountain?? Oh, yes, YUCCA Mountain. Well, that's better than under the sand dunes of Cape Cod, thank you. NUCLEAR POWER IS NOT CHEAP! (PNPS-D-AA)

Comment: What's wrong? What about the generation of half-again as much spent fuel and so-called low-level waste? There is new and significant information indicating that there will NOT be an offsite storage solution anytime soon - not within NRC's stated estimates. The staff simply ignored reality and rests its case on the now outdated Waste Confidence Rule. (PNPS-D-EE)

Comment: My concern has to do with the spent fuel which is stored onsite.

Although the Commission found that the site can safely accommodate the on site storage of the additional volume of spent fuel, it seems to have operated under the assumption that there will be a permanent repository developed in some remote part of the United States. Given that such a storage site needs to be in some remote, stable part of the United States, I do not understand how the Commission can think that the permanent storage of spent fuel in Plymouth, which is not as remote and is not as geographically as sites such as Yucca Mountain, Nevada.

When the Plymouth Nuclear Plant was first approved, the working assumption was that only temporary storage of spent fuel would be required on site. Given that during the past 30+ years, no fuel has been shipped off-site, a prudent person would have to look at the storage as permanent. As such, the Plymouth on site storage should be looked at as if permanent and the requirements should be as strict as those used in choosing a "permanent repository". I do not think that the Plymouth site would qualify.

At the least, the NRC should insist that the operator treat the spent fuel storage as permanent and provide the safest type of storage possible. At this time, I do not believe that pool storage is the "safest" means for a permanent storage. (PNPS-D-JJ)

Comment: The next area was nonaccident view to radioactive waste. Again, small impact, how can there be a small impact? Because, number one, when you are looking at spent fuel, it is assuming there is validity to the fantasy of the Nuclear Waste Confidence Act, that somehow Yucca is going to be there, or a radioactive waste fairy is going to come or God knows what they are assuming. But we know reality and one of the NRC commissioners was quoted in all the papers yesterday, Commissioner Merrifield, that he has no confidence in Yucca and that we, essence, should start again from zero. So, without looking at and providing a plan of what people are going to do with this high level waste, how can one say then that there is no impact? (PNPS-D-M)

Comment: You have no safe or secure area to store the radioactive wastes generated by your nuclear power plants. As my Amish neighbors have repeatedly stated at the local meetings near Three Mile Island for 28 years , "You built a house without an out-house!" (PNPS-D-PP)

Comment: The second reason that the draft found small impacts results from incorrectly assuming the current NRC regulations, many of which are written in the 1970s are, a, they are being met by the licensee, and that these regulations themselves reflect current realities and are indeed protective of public health and safety, so they more or less put us in a catch-22. An example is that the draft found spent fuel that would be half again, as much generated over the relicensing period was of small impact because of the assumption that this stuff will have someplace to go.

Even Ed McGaffigan, a Commissioner of the NRC, said Monday the Yucca Mountain program is deeply flawed and that folks better start looking someplace else. (PNPS-D-Q)

Comment: And the answer to this question has always been that it's satisfactorily addressed in these kinds of studies on a national level with scenarios that deploy off-site storage. So we just get it out of Pilgrim, off-site storage facilities and the possibility down the road of a yet to be determined Yucca Mountain Site, which we heard discussed earlier, but I think there is new and significant information that hasn't been taken into account that sort of nullifies these answers and these ways of sort of pushing the issues aside.

First, we heard earlier about Yucca Mountain, it's not going to open as predicted for the disposal of the waste and I believe somebody said that one of the NRC commissioners is now acknowledging that. I think that's pretty new information in my mind. Certainly, if it ever does open, it isn't going to open as predicted, it's going to be a long period off which means you are going to have more and more waste stored up and it's going to have to stay on-site, I believe. (PNPS-D-W)

Response: *Onsite storage of spent nuclear fuel is a Category 1 issue. The safety and environmental effects of long-term storage of spent fuel onsite has been evaluated by the NRC, and, as set forth in the Waste Confidence Rule. The NRC's Waste Confidence Rule, found in 10 CFR 51.23, states: The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations. Further, the Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time. In its Statement of Considerations for the 1990 update of the Waste Confidence Rule (55 FR 38,472 [September 18, 1990]), the Commission addressed the impacts of the disposal of spent fuel discharged from the current fleet of reactors operating under existing and renewed licenses and from a new generation of operating reactors. The rule was last reviewed by the Commission in 1999 when it reaffirmed the findings in the rule (64 FR 68,005 [December 6, 1999]).*

With respect to Yucca Mountain specifically, for over two decades, research has been conducted to determine whether a site near Yucca Mountain, Nevada, is suitable for safely isolating highly radioactive nuclear waste. Four major steps - site characterization, site approval, licensing review, and construction- have to be completed before operation of the proposed high-level waste repository could occur. The first step, site characterization, including excavation of exploratory tunnels and testing of groundwater, has been completed. The result of the characterization study was documented by the development of an environmental impact statement (EIS). A draft EIS was published in 1999 and a supplemental EIS in 2001. The final EIS was published along with a site recommendation in 2002.

The second step is site approval. Following publication of the final EIS and the U.S. Department of Energy's (DOE's) determination that the site is scientifically suitable for a geologic repository, President Bush recommended the Yucca Mountain, Nevada, site for development as a geologic repository. On July 9, 2002, the U.S. Congress approved this recommendation in Joint Resolution 87, which designated Yucca Mountain as the repository for spent nuclear waste. On July 23, 2002, the President signed Joint Resolution 87 into law (Public Law 107-200, 116 Stat. 735 [2002]).

The DOE is currently focused on the third major step of the process. The DOE is preparing an application to obtain a license from the NRC to construct a repository. The NRC is responsible for developing the regulations to implement the U.S. Environmental Protection Agency (EPA) safety standards and for licensing the repository. After the DOE submits the license application to the NRC, the NRC has three years to review the application and could request a fourth year from Congress, if needed, to make its determination on licensing.
If licensed, the final step is construction and operation of the facility. The construction process would be conducted by the DOE, which has the responsibility for developing a permanent disposal facility for spent fuel and other high-level waste and which would operate the facility.

These comments provide no new and significant information. Therefore, no changes have been made to the SEIS.

Comment: Let's assume, as the Draft does, that Yucca will open -some day off in the future. The Draft ignores new and significant information about transportation hazards and shipping cask integrity. In fact, they never present the transportation plan for getting the tons of spent fuel out of here.

As part of the current plan, DOE proposes up to 24 barges carrying giant high-level radioactive waste containers onto Cape Cod Bay, Massachusetts Bay and Boston Harbor bringing hundreds of tons of dangerous poisons to densely populated Boston to be transferred from there by rail.

Will the public go along? Accidents happen and each barge sized container would hold up to 200 times the long-lasting radioactivity given by the Hiroshima atomic bomb. Leakage of even a fraction could mean catastrophe. How do you ever recover it?

NRC design criteria for waste transport containers are woefully inadequate. Rather than full scale physical testing, scale model tests and computer simulations are all that is required. The underwater immersion design criteria test examines the integrity of a slightly damaged container submerged under 3 feet of water for 8 hours. An undamaged cask is paper-tested for 1 hour submersion under 656 feet of water. If a cask were accidentally immersed under water or sunk by terrorists, is it reasonable to assume that the cask was only slightly damaged, or not damaged at all? Barge casks weigh well over 100 tons (up to 140 tons), how can NRC assume

that they will be recovered underwater somewhere en route to Boston within 1 hour, or even up to 8 hours? Special cranes capable of lifting such a heavy load would have to be located, brought in and set up after finding where it went, perhaps in inclement weather. (PNPS-D-EE)

Comment: Is, if you are talking about waste, is transportation. Again, the transportation, God knows, let's pretend that there will be a Yucca or there will be someplace to put the stuff, then the issue is how is it going to get there? The draft brightly says impact small, how do they know it's going to be small? A, what's the plan? I've read the plan in DOE and apparently 24 barges are going to South Boston to be put on a railroad to go through like Chicago, does anyone in their right mind think this is going to happen when one of the casks per barge has 40 times the radiation in the Hiroshima bomb?

Do you think Cohasset, Hingham, Senator Lynch, how about the people in South Boston? He will be lynched, but the point being that these issues have not been looked at seriously because of my general comment in the beginning, that the draft is playing games by pretending that rules, policy that the NRC has are real and that because the plan is there and it's going to happen that we don't have to worry about it so it's significance is small. (PNPS-D-M)

Response: *The NRC has conducted several transportation studies to evaluate the risk of transportation of radioactive material. NUREG-0170 (NRC 1977b), supported NRC's 10 CFR Part 71, "Packaging and Transportation of Radioactive Material" rulemaking. Based on this study, the Commission concluded that the transportation regulations are adequate to protect the public against unreasonable risks from the transport of radioactive materials, including spent fuel. The NRC sponsored another study in the 1980s entitled, "Shipping Container Response to Severe Highway and Railway Accident Conditions," NUREG/CR-4829 (Fischer et al. 1987), or the "Modal Study." Based on the results of this study, the NRC staff concluded that NUREG- 0170 overestimated spent fuel accident risks by about a factor of three. In March 2000, the NRC initiated another spent fuel study, "Reexamination of Spent Fuel Shipment Risk Estimates," NUREG/CR-6672 (Sprung et al. 2000). This study focused on risks of a modern spent fuel transport campaign from reactor sites to possible interim storage sites and/or permanent geologic repositories. This study concluded that accident risks were much less than those estimated in NUREG-0170 and that more than 99 percent of transportation accidents are not severe enough to damage NRC-certified spent fuel casks. While very severe accidents could cause cask damage, the studies show that releases of material would be small and pose little risk to the local population/public. The most severe accidents might cause greater releases, but their likelihood is so remote that the NRC considers the risk to public health to be low. The NRC's regulations for the safe transportation of radioactive materials have evolved over the years, e.g., the 2004 revisions to achieve compatibility with International Atomic Energy Agency (IAEA) Transportation Safety Standards. However, the basic specifications for shipping containers have largely not changed. For instance, Type B shipping containers, such as those used for spent fuel, must withstand the effects of a 9-m (30-ft) drop test, puncture, fire, and immersion. Basic radiological dose rate limitations have not changed. While some of the*

details in the regulations have been changed, the NRC staff believes that the basic safety standards that determine the performance of shipping containers under normal and hypothetical accident conditions have been properly accounted for in the SEIS. Nevertheless, transportation of spent fuel is a Category 1 issue. These comments provide no new and significant information. Therefore no changes have been made to the SEIS.

Comment: Highly radioactive particles (especially in the gaseous state) are given off into the environment in every stage from mining to processing, to producing, to usage in plants, to secondary reprocessing and then years of storage - the methodology of STORAGE, of course, has not been tested for "centuries" - only theorized. Just WHERE do radioactive "tailings" go ?? Nuclear power is NOT cheap. (PNPS-D-AA)

Response: *Nuclear power facilities have temporary storage for spent fuel in steel-lined concrete pools that are filled with water (spent fuel pools). The water acts as a natural barrier for radiation from the fuel assemblies and keeps the fuel thermally cool while it decays and becomes less radioactive. Because the designers of the nuclear power facilities originally anticipated that the spent fuel would be reprocessed, they designed the nuclear facilities to store about a decade's worth of used fuel. However, at this time commercial reprocessing is not being pursued. If the storage capacity of the spent fuel pool is approached, then licensees may consider alternatives, such as above-ground dry storage casks. Another option for storage of fuel is in an away-from-reactor interim storage facility. Private Fuel Storage, LLC (PFS), has submitted a request to the NRC for a license to build such a privately owned facility on the reservation of the Skull Valley Band of Goshute Indians, about 80 kilometers (50 miles) southwest of Salt Lake City, Utah. On February 24, 2005, the Atomic Safety and Licensing Board (ASLB) completed its review of the proposed spent nuclear fuel storage facility and ruled in favor of the PFS. The Commission upheld the ASLB decision in a Memorandum and Order dated September 9, 2005, and authorized the NRC staff to issue a license to construct and operate the PFS facility.*

Uranium tailings are primarily the process waste material from a conventional uranium mill. All wastes produced by these fuel fabrication facilities are regulated by the NRC's Office of Nuclear Material Safety and Safeguards to ensure adequate protection of public health and safety. Uranium tailings disposal is part of the fuel cycle and was evaluated in the GEIS as a Category 1 issue. This comment provides no new and significant information. Therefore, no changes were made to the SEIS.

Comment: So there is a whole host of issues and additional mitigations that need to be addressed from this increased risk and the severe impact of terrorists targeting a build up of radioactive waste on the site as a result of a lack of places to put it around the country because, a, Yucca Mountain isn't going to go on schedule, b, this facility in South Carolina that takes many classes of this waste is closing. I think it's closing in 2008, this is the Barnwell, South Carolina. (PNPS-D-W)

Comment: Because of the second factor, this second piece of new information which is that an announcement has been made that there is going to be a closing of a key facility where this radioactive waste is dumped, that's a facility in South Carolina that's capable of taking this waste.

This facility takes many classes of this waste, I guess this waste is broken up into four or five different classes, there is high level, there's mixed waste, and this plant takes it all or most of it. And these GEISs require that the analysis that the NRC accounts for the adverse impacts associated with this issue of radioactive waste and if no information is discovered in the GEIS, this is my understanding of the way this works, the generic environmental impact statement, then the issue is called settled, it's been settled at the national level and we don't have to deal with it here at Pilgrim.

So if the issue is local, then it's going to have to be assessed for obvious reasons and mitigated in this Pilgrim SEIS, that's my feeling. Either way you look at it, national or local, the issue has to be addressed and it wasn't, there was really no mention of this information. Both NRC and Entergy in this book kept stating that they are not aware of any new information that would effect the Pilgrim environment, I feel that this will effect the Pilgrim environment. What's the impact of this new information on this report? The primary impact of this information is that Pilgrim needs now to assess how much waste is going to be on-site, with the assumption that there is going to be a lack of off-site storage.

The residents need a plan B, I need to know that somebody has thought through this, not to say, oh, we'll fix it later, it'll come. There has got to be a place for safe storage of this waste at the site, I want to see a plan for it because this could happen. The plan and assessment need to be evaluated in this SEIS report, that's my feeling. Furthermore, the quantification of this issue needs to be addressed in terms of volumes and curies of radioactive isotypes that will be coming out of the plant as a result of decommissioning, even after 2032, if the license were extended.

It's not just an issue for the next 20 years, in my feeling, when you put this SEIS report together, you've got to think about what happens after decommissioning, assuming that we don't have a third renewal.

But if new information comes forward and it applies specifically to Pilgrim, which is what I'm contending here is that we've got the closure of these facilities, that's going to affect Pilgrim because we are not going to have a place to put this, there is no plan B here, then the issue is a Pilgrim issue and either the NRC or Entergy should acknowledge it and deal with it for the residents. (PNPS-D-W)

Comment: The same could go for low level waste, low level waste is a misnomer because it is everything but the spent fuel and it can have some highly toxic and long-lived radio nucleates in it. Entergy is a major producer of this stuff, the new and significant information that was overlooked was that Barnwell, South Carolina, which takes our waste, has said by June, '08 the door is shut, also they say in the draft that they have confidence that other sites will be built. That's baloney, there has been millions of industry money spent to try to find a site in Illinois, etcetera, etcetera, etcetera, and no new sites have been built because nobody wants it.

Massachusetts had the beginnings of a search in the '90s and they stopped looking, so what is going to happen to this? Again, if it is the plan, if it is not realistically looked at and a plan is not put forward, you cannot analyze it and say it's going to be no problem. And so what we will have on our eroding coastline on Cape Cod, subject to increasing storms from global warming, etcetera, etcetera, etcetera, turning into a high level and low level radioactive waste dump until my kids are my age. This has to be analyzed and faced honestly, okay? (PNPS-D-M)

Response: *The comments are related to the environmental impacts associated with the uranium fuel cycle and Low Level Radioactive Waste Management. Low-level waste storage and disposal were evaluated in the GEIS and were determined to be Category 1 issues. The impact was determined to be SMALL. The Commission is confident that all nuclear waste generated will be handled, stored, and disposed of in a manner that assures public health and safety. The comment provides no new and significant information and no changes have been made to the SEIS.*

Comment: What about depleted uranium ..... Did you forget that 1000's of leaking barrels of depleted Uranium have contaminated the underground water supply of Paducah Kentucky....where 38,000 cylinders of depleted Uranium await SOME KIND of disposal as well as those at enrichment facilities in other states? When will Pilgrim's overly populated cooling tower be depopulated and WHERE will the rods be taken....and who will pay for their very carefully orchestrated removal and transportation? Nuclear power is NOT cheap. (PNPS-D-AA)

Response: *Depleted uranium is defined as uranium having a percentage of uranium-235 smaller than the 0.7 percent found in natural uranium. It is obtained from spent (used) fuel elements or as byproduct tails, or residues, from uranium isotope separation such as through gas centrifugation enrichment. The United States Enrichment Corporation (USEC) owned by the U.S. Department of Energy, and operated by the USEC, a wholly owned subsidiary of USEC Inc. in Paducah Kentucky, is a uranium enrichment facility. The USEC facility is governed by NRC regulations 10 CFR 40, 70, 73, 74, and 76. NRC considers depleted uranium that has no commercial value to be low level radioactive waste. If the depleted uranium has no commercial use, the licensee can transfer the material to DOE or dispose of it at a commercial disposal site if it meets the disposal sites requirements.*

Incidents of leakage that may result (past, present, or future) at the USEC facility in Paducah, KY are outside the scope of this license renewal proceeding and would be handled by the NRC Office of Nuclear Material Safety and Safeguards, Division of Fuel Cycle Safety and Safeguards. Contact information for this office can be found on NRC website, www.nrc.gov. This comment provides no new and significant information; therefore, it resulted in no changes to the SEIS.

Comment: And just specifically regarding the comment about global warming that I believe Joyce McMahon made earlier, I just want to point out that, you know, studies have shown that the life cycle of creating electricity from a nuclear power plant is actually greenhouse gas intensive because you include the fuel processing. (PNPS-D-S)

Response: *The NRC licenses and inspects all commercial nuclear fuel facilities involved in the processing and fabrication of uranium ore into reactor fuel, including facilities that enrich uranium. Enrichment technology in the United States will likely rely on gaseous centrifuge technology that will use 90 percent less energy that the gaseous diffusion technology. Enrichment of uranium respective to the uranium fuel cycle process is a Category 1 issue addressed in the GEIS. Licensing and operation of a facility would be handled by the NRC Office of Nuclear Material Safety and Safeguards, Division of Fuel Cycle Safety and Safeguards. Contact information for this office can be found on NRC website, www.nrc.gov. This comment provides no new and significant information; therefore, resulted in no changes to the SEIS.*

Comment: Page 2-16, Line 2 - It is unclear why the High Pressure Coolant Injection System is singled out here. A number of systems could conceivably cause steam leakage outside primary containment that would be monitored by the reactor building vent system. (PNPS-D-MM)

Response: *The comment is noted. The sentence will be revised to indicate that the primary containment venting, steam leakage outside the primary containment, hood vents, and high pressure coolant injection testing are among the potential sources of low-level radioactive contaminants at PNPS.*

Comment: But I am happy to see that the NRC has acknowledged something that Pilgrim admitted which is that there is, with this radioactive waste, a "irreversible and irretrievable resource commitment needed", that's as far as things went in this report or in this application. The Pilgrim application for the license renewal lists this commitment that's needed for radioactive waste as simply, and I put this in quotes too because it's right in the application, "land is required to dispose of spent nuclear fuel and low level radioactive wastes". So this is the closest that the applicant's environmental report and the NRC's DSEIS came to addressing this issue, which I think has new and significant information. It's very disturbing to me that nobody has acknowledged it and made a plan B. (PNPS-D-W)

Response: *The comment is related to waste management and storage issues. Waste management issues were evaluated in the GEIS and determined to be a Category 1 issue. Onsite storage of spent nuclear fuel is also a Category 1 issue. The safety and environmental effects of long-term storage of spent fuel onsite has been evaluated by the NRC, and set forth in the Waste Confidence Rule. In the Waste Confidence Rule, the Commission determined that spent fuel can be stored onsite for at least 30 years beyond the licensed operating life, which may include the term of a renewed license. At or before the end of that period, the fuel would be moved to a permanent repository. The GEIS is based upon the assumption that storage of the spent fuel onsite is not permanent. The supplement to the GEIS prepared regarding license renewal for the Pilgrim Nuclear Power Station, is based on the same assumption. This comment provides no new and significant information and, therefore will result in no changes to the SEIS.*

Comment: The NRC staff incorrectly concluded that there was no new and significant information and therefore there would be no impacts of low level waste storage and disposal associated with the renewal term. Further the staff mistakenly agrees with the GEIS that, "...The maximum additional on-site land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small." And, "...the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirement."

The NRC staff did not bother to look at new and significant information pertinent to this site and must be required to do so before finalizing the SEIS.

- Pilgrim is a very large generator of LLRW. In 2003, for example, Pilgrim shipped 59,089 cubic feet, containing 1,210.000 curies; and stored 4,178.3 cubic feet containing 4,620.000 curies.
- Barnwell S.C. announced that it will close to Massachusetts generators June 20, 2008.
- Massachusetts is not a member of any compact; in order to join Massachusetts would have to agree to be a host community; Massachusetts indicated clearly in the mid 1990's that it would not be a host community.
- Texas may open, no guarantees, and if it does open there is no assurance that non-Texas Compact members will be able to send their waste there and if allowed whether fees would be prohibitive.
- No sites have been developed anywhere in the country despite millions of dollars spent on failed attempts.
- Terrorism or acts of malice were not considered a threat in 1972. Not so, post 9/11 - nuclear facilities/materials are known to be attractive targets.
- Pilgrim is located on Cape Cod Bay and the property slopes towards the Bay so that any leaking contaminants from waste storage facilities will flow towards and eventually into the Bay. There are no monitoring wells lining the shoreline. Further the coast is a salt corrosive

environment and its effect on concrete and waste packaging must be analyzed.

- The undisputed recognition of global warming is new and brings with it increased severity of coastal storms, erosion, and increased sea levels. Hence this must be factored into on-site waste storage options.

Storage of LLRW is important for our community's health and safety because there is nothing low level about the waste. Waste is characterized "high" or "low" depending on where it comes from, how it is generated, not according to its' toxicity and longevity. Waste containers and forms will not last as long as some waste remains hazardous. Therefore, we want to know what Entergy's plans are for storing LLRW; monitoring the releases; and what are the "acceptable" public radiation exposures and health risks.

We deserve to know what the LLRW storage plans are before the application is decided; so that the re-licensing decision does not prejudge any LLRW storage decision. (PNPS-D-EE)

Comment: Now we might be splitting hairs in terms of the linguistics here, but here at are the two issues, one issue, the environmental impact of the fuel cycle's radioactive waste. There has always been a question of what's the environmental impact of large amounts of stored radioactive waste as a result of Pilgrim's operation from the current license as well as the renewed license, and what I'm referring to is the vast amount of harmful waste that's produced, excluding the fuel, spent fuel waste and the fuel rods. (PNPS-D-W)

Response: *These comments are related to the impacts associated with Low Level Radioactive Waste Management (LLW) at PNPS. LLW was evaluated in the GEIS and determined to be a Category 1 issue. The NRC staff did not identify any new and significant information during its independent review of the Entergy ER, the site visit, the scoping prcess, or the evaluation of other available information. Therefore, the NRC staff concludes that there would be no impacts regarding LLW beyond those discussed in the GEIS. In addition, the Commission is confident that all nuclear waste generated will be handled, stored and disposed of in a manner that assures public heath and safety. The comments provide no new and significant information: therefore, no changes have been made to the SEIS in response to these comments.*

Comment: Further, the "clean liquid waste with abnormally high conductivity" that may or may not be "evaluated for controlled release into the circulating water discharge canal through the liquid radioactive waste header." (Entergy 2006a).

It is not clear whether the discharge is sent into Cape Cod Bay or a separate enclosed area.

Also, "The liquid wastes are automatically transferred to the chemical waste receiver tanks when the sump is filled to a present level. After decay and storage, the chemical liquid wastes

are evaluated for discharge or reprocessed" (or released?). (Entergy 2006a). Again, it is not clear how the evaluation process works to determine where the waste can be disposed of, in the Bay or not. (PNPS-D-LL)

Response: *The liquid wastes in question are discharged to the Bay through the liquid radioactive waste header. The text in Section 2.1.4.1 describes how the waste is evaluated before and during discharge to verify that it meets the radiological limits specified by NRC regulations. Also, Section 2.1.4.1 describes how the Radiological Environmental Monitoring Program has evaluated these discharges, and confirmed that all liquid discharges were within NRC regulatory limits. No changes to the SEIS have been made based on this comment.*

Comment: It was far from "sound" in that it ignored a spent fuel pool accident at Pilgrim. The NRC staff excused this by misinterpreting prior cases and going to the wrong section of the GEIS.

The NRC in Turkey Point concluded that the GEIS exempts spent fuel pools. They did so by referring to section 6 of the GEIS , which deals with "The Uranium Fuel Cycle and Solid Waste Management" under normal operations, rather than going to section 5 of the GEIS, which deals with "Environmental Impacts of Postulated Accidents." Section 5 includes definitions of "severe" and "accident" and does not limit these to reactor accidents in any way.

Section 5.2.1 of NUREG 1437 "General Characteristics of Accidents" begins its discussion of design basis and severe accidents with a definition of these terms. "The term 'accident' refers to any unintentional event outside the normal plant operational envelope that results in a release or the potential for release of radioactive materials into the environment . . . 'severe' . . .[includes] those involving multiple failures of equipment or function and, therefore, whose likelihood is generally lower than design basis accidents but where consequences may be higher . . ."

It is their potential for "releases substantially in excess of permissible limits" that makes it necessary to consider them in SAMAs. This entire SAMA section focuses on potential consequences to determine whether a potential accident is severe or not - not whether the source is the reactor core or elsewhere at the plant. (PNPS-D-EE)

Comment: NRC staff failed to mention the new and significant information on potential health consequences from a spent fuel pool accident. Conclusions the National Academy of Sciences - Safety and Security of Commercial Spent Fuel Storage," National Research Council of the National Academy of Sciences, Public Version, April, 2005 Finding 3B - "... a terrorist attack that partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and the release of large quantities of radioactive materials to the environment. Details are provided in the committee's classified report" NAS, p. 6; "Such (zirconium cladding) fires would create thermal plumes that could potentially transport radioactive aerosols hundreds

of miles downwind under appropriate atmospheric conditions". NAS, p.50; and "The excess cancer estimates ...to between 2,000 and 6,000 cancer deaths" NAS, p. 45. The NAS report pertains directly to Pilgrim because it was among the reactors pointed out to be more susceptible to damage due to its design placing the pool in the "attic" - vulnerable from three sides. (PNPS-D-EE)

Comment: National Academy of Sciences - "Finding 2A: Spent fuel storage facilities cannot be dismissed as targets for such attacks because it is not possible to predict the behavior and motivations of terrorists, and because of the attractiveness of spent fuel as a terrorist target given the well known public dread of radiation...The committee judges that attacks by knowledgeable terrorists with access to appropriate technical means are possible." NAS, p.4

"Terrorists view nuclear power plant facilities as desirable targets because of the large inventories of radionuclides they contain. The committee believes that knowledgeable terrorists might choose to attack spent fuel pools because: (1) at U.S. commercial nuclear power plants, these pools are less well protected structurally than reactor cores; (2) they typically contain inventories of medium - and long-lived radionuclides that are several times greater than those in individual reactor cores." NAS, p.36

"A loss-of-pool-coolant event resulting from damage or collapse of the pool could have severe consequences. Severe damage of the pool wall could potentially result from several types of terrorist attacks, for instance: (1) Attacks with large civilian aircraft; (2) Attacks with high-energy weapon; Attacks with explosive charges." NAS, p.49

"Finding 3B -... a terrorist attack that partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and the release of large quantities of radioactive materials to the environment. Details are provided in the committee's classified report." NAS, p.6

"Such (zirconium cladding) fires would create thermal plumes that could potentially transport radioactive aerosols hundreds of miles downwind under appropriate atmospheric conditions." NAS, p.50

"The excess cancer estimates ...to between 2,000 and 6,000 cancer deaths" p.45

2) An analysis of spent fuel pool accident at Pilgrim was performed by Dr. Jan Beyea for the Massachusetts Attorney General's Motion to Intervene in Pilgrim's re-licensing application. [The Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket No. 50-293, May 26, 2006 includes a Report to The Massachusetts Attorney General On The Potential Consequences Of

A Spent Fuel Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant, Jan Beyea, PhD., May 25, 2006.]

Dr. Jan Beyea's estimated the consequences following the release of Cesium-137 from Pilgrim's spent-fuel pool. We recognize that these are conservative estimates because: (1) he only considers Cesium-137, other radionuclides would be released; and (2) he only looks at latent cancers and not other radiation-linked diseases, reproductive disorders and birth defects.

	10% release C-137	100% release C-137
Cost (billions)	$105-$175 billion	$342-$488 Billion
Latent Cancers	8,000	24,000

3) Operating with faulty fuel cladding was not taken into account, either - both the probability and consequences of postulated accidents may be increased when nuclear plants operate with pre-existing fuel cladding failures. Degraded fuel is an on going issue for the industry. NRC Commissioner Merrifield has admitted nearly 1/3 reactors now have failed fuel, and the trend is increasing, not decreasing. Briefing on Nuclear Fuel Performance, Transcript, p.4, (February 24, 2005), http://www.nrc.gov. (PNPS-D-EE)

Comment: NRC staff do not mention, the new and significant site specific report by the Massachusetts AGO, Report to The Massachusetts Attorney General On The Potential Consequences Of A Spent Fuel Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant, Jan Beyea, PhD., May 25, in Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket No. 50-293, May 26, 2006. The report estimated the costs and latent cancers of Cesium-137 releases from Pilgrim's spent fuel as follows:

	10% release C-137	100% release C-137
Cost (billions)	$105-$175 billion	$342-$488 Billion
Latent Cancers	8,000	24,000

(PNPS-D-EE)

Comment: The DSEIS's findings ignore new and significant information regarding the dangers of spent fuel storage. For example, staff ignored:

- The National Academy of Sciences Report Safety and Security of Commercial Spent Nuclear Fuel Storage Public Report, April 2005;
- Dr. Jan Beyea's report for the Massachusetts Attorney General's Motion to Intervene in Pilgrim's Re-Licensing Application, May 2006;

- Pilgrim Watch's Motion to Intervene in Pilgrim's Re-Licensing Application, Contention 4, May 2006;
- The Massachusetts Attorney General's Petition for Rulemaking, August 2006 that calls, for example, for NRC to consider new and significant information showing that the NRC's characterization of the environmental impacts of spent fuel storage as insignificant in the 1996 Generic Environmental Impact Statement for Renewal of Nuclear Plant Licenses ("License Renewal GEIS") is incorrect; and
- The fact that NRC's Waste Confidence Rule is fantasy or wishful thinking- there is no likelihood that the spent fuel at Pilgrim will leave Plymouth anytime soon or ever.

More basically - there is no storage plan for spent fuel presented in the Application or any subsequent study by the NRC review staff so that the onsite storage plan can be analyzed; therefore there is no basis for the NRC staff to claim that the environmental impact of storing half-again as much until 2032 presents no environmental risk. (PNPS-D-EE)

Comment: The new and significant information is the National Academy of Sciences spent fuel vulnerability study where they identified reactors that have the spent fuel pool located in the attic of the reactor, as Pilgrim, are especially vulnerable to attack.

This has gone into the dangers of densely packed pools, like Pilgrim, that are inside the main reactor building, outside primary containment at the top. In the Massachusetts Attorney General's motion to intervene, there is an attachment by Dr. Gordon Thompson, again new and significant information, that discusses the danger of a highly, densely packed spent fuel pool, fire and what the consequences would be. Again, to remove this from discussion of postulated accidents is ludicrous.

Then, by not looking at these issues, you do not come up with then, an analysis of mitigation which clearly, for spent fuel, as put forth in the attorney general's motion, would be to analyze the effect of having a lightly packed spent fuel pool and putting the rest into secured dry-cask storage. Also, an analysis should be required of the recommendations in the National Academy's study such as what fact an analysis would be the effect of, reconfiguration of the pool? What realistically is the effect of the firehose brigade, etcetera, so we can have a true analysis. (PNPS-D-M)

Comment: And what they didn't say when they were talking about health effects in the postulated accidents section of the new and significant information presented by the Massachusetts Attorney General of the likely health consequences of a spent fuel pool accident at Pilgrim, yes, 24,000 cancers expected if there is a complete release of just Cesium 137, 8,000 if only ten percent of that bad guy is released.

What they didn't say under postulated accidents was a reference to the Sandia National Report, the CRAC-II which in 1982 NRC asked them to do for the consequences specifically of a core

melt at each reactor and what that study said was that you could expect 3,000 early injuries -- no, what was it? No, 3,000 fatalities and 30,000 early injuries, that was '82.

But what they didn't look at was Dr. Edwin Lymon, a Union of Concerned Scientists report done on why these figures have to be updated, why they are conservative, new information of why this is pertinent now. And so by ignoring or misinterpreting these important factors, they fail then to look at significant mitigation that could occur and they ignore the fact that, guess what? I don't know how much radiation is coming out of there, Entergy doesn't know and the NRC doesn't know, and so an important mitigation step going forward, if you are honest about health effects, is to have a requirement or look at to analyze.

I mean that's what you are supposed to be doing, having combination real-time wind and radiation detectors placed in logical areas in off-site communities that provide real-time data on this to the state, and to the local communities and to the NRC. Hey they should know too. (PNPS-D-D)

Comment: In the GEIS Section 5 it deals with design-basis and severe accidents with an emphasis on releases substantially in excess of permissible limits for normal operations. Nowhere in this section is the spent fuel pool excluded nor the reactor core cited as the only risk. Therefore, I will argue that you are remiss not to include in the supplement the spent fuel pool under postulated accidents. (PNPS-D-D)

Comment: Leaking Spent fuel storage facilities associated with, and a part of the very license renewal process now under review. The spent fuel pools are an integral part of the reactor, and in fact and deed are routinely used as a part of the reactor fueling and operational process. The spent fuel pools in fact and deed are attached too, a part of the whole of a reactor, just as all other component parts are, including values, panels, the control room and the core itself. (PNPS-D-A)

Comment: If a application to extend a license is granted, the licensee is not going to be forbidden from using and accessing this important part of the process, and in fact and deed a reactor cannot continue in operation without a safe, secure, functioning spent fuel area that does not threaten the environment, that is not leaking materials (which is a sure sign of wall fatigue, and a sign of potentially imminent wall collapse) and present no unacceptable risks to human health. The NRC is wrongfully attempting to remove consideration of the spent fuel pools at reactor sites to protect first their licensees, secondly the industry's cash flows, and lastly the DOE who has failed completely in keeping their promise to the American public in safely dealing with and removing waste from nuclear reactor sites. (PNPS-D-A)

Comment: The Draft Supplemental GEIS is inadequate to satisfy the requirements of the National Environmental Policy Act ("NEPA") or NRC regulations for the implementation NEPA, because it fails to address new and significant information regarding the potentially severe

adverse environmental impacts of continued high-density pool storage of spent fuel at the Pilgrim nuclear power plant. (PNPS-D-HH)

Comment: Because, which I find interesting, because they avoided talking about spent fuel, avoided talking about terrorism, this helps explain their conclusion that these alternative sources of energy, such as wind, solar, gas, etcetera, would have a greater impact, would be more expensive, would be all these other things. Clearly, if you look at, if you factor in security, if you factor in waste, if you factor in a true analysis of consequence where the attorney general, for example, a report to him indicated a specific consequence analysis of a spent fuel accident of Pilgrim, that if 100 percent of the cesium 137 was released, it would bring about $488 billion in damage. If ten percent of that were released, $105 to $175 billion. If 100 percent were released, which is likely in a terrorist attack situation, 24,000 cancers, ten percent, 8,000 cancers. (PNPS-D-Q)

Comment: The second issue is involving spent fuel, spent fuel has to be looked at under the section of postulated accidents. If you look at the GEIS, the GEIS or whatever, it says, it describes in Section 5 explicitly environmental impacts of postulated accidents, they define severe, they define accident and they don't limit either to the reactor. They do this, however, in Section 6 which deals with exclusively normal operations and that's where they say the spent fuel doesn't have to be considered.

So, what does this mean? All the new information that we have about the dangers of spent fuel storage at Pilgrim provided by the National Academy of Sciences, indicating that the way the fuel is stored at Pilgrim is among the most dangerous in the country, an analysis has to be done on the lack of security from an air attack, from water, land and then an analysis of the various mitigations to decrease risk such as a requiring a dense, a low density pool, secured dry cask storage, what about reconfiguring the pool? What about alternative water, spray water systems? This has to be analyzed and put forward. (PNPS-D-Q)

Comment: Second, new and significant information on this issue of the spent fuel pool, the original GEIS assessed the fuel pool accident probability and impact or since the original GEIS assessed the probability and impact of spent fuel pool impact when it was assessed as a leakage that can be managed, the Pilgrim, locally here, fuel rod densities have been increasing substantially due to the lack of off-site fuel rod storage and a lack of an approved on-site cask storage plan. At the same time, there are credible scientific reports, that are new and I think significant, that have been published that essentially state that above ground spent fuel pools are the most dangerous method of storage and when they are tightly packed, the danger increases.

So the tight packing is new, the reports that this is a danger and the most dangerous form are new and the consequences of that packing, which I'll get to right here next, is also new. In 2005, a National Academy of Science report to Congress, which was a report that was

sponsored by the NRC and the Department of Homeland Security, described a scenario with the partial loss of pool water where the fuel rod cladding or the casing of the fuel rod catches fire.

The first, this scenario was first described years ago by Sandia National Laboratory which is a very famous laboratory, so it's been described by several scientists is my point here but very recently by the NAS on behalf of the NRC and the Department of Homeland Security in a report to Congress. (PNPS-D-V)

Comment: Both the applicant's environmental report and the NRC's DSEIS have stated there is no new and significant information on spent fuel that might impact the environment. There is mention at some point, I think the previous speaker to me said that there was mention of something about the spent fuel pool and how there could be mitigation measures using dry cask storage and the like but, right now, as it begins to become packed, well prior to cask, dry cask storage being implemented, it is an increasing danger, the fire that we are referring to.

So it was also surprising to me that I found out from this report to Congress recently that Entergy has begun studying the pool fire scenarios and even they said there is no new and significant information on spent fuel. (PNPS-D-W)

Comment: Other credible scientific reports found in the Journal of Science and Global Security, for example, have new and significant information of a more specific nature on this issue, they explain how a major human and environmental disaster would result from the overheating and burning of a protective fuel rod cladding in a densely packed pool. They describe how the fire could easily release, result in the release of massive amounts of radioactive product, cesium being the worst, and that, in its report that I referred to, to Congress, the estimate of cancer deaths from a typical scenario with a cesium release is from 2,000 to 6,000 deaths. I would say that's a significant impact.

A full release would dwarf Chernobyl's release, based on the amount of cesium at Pilgrim. I believe it's, our spent fuel pool at Pilgrim has several times the amount of cesium that was in existence at Chernobyl and released at Chernobyl. The Massachusetts Attorney General has a report, and I think it was referred to by an earlier speaker, that describes the consequences of such an accident at Pilgrim, specific to Pilgrim, they are between, in these terms for somewhere between a 10 and 100 percent release of the cesium.

So, if 10 percent is released or 100 percent is released, somewhere in that range, this is the range of the consequences in that report for Pilgrim. The cost would be somewhere between $105 and $488 billion and the cancers would effect somewhere between 8,000 and 24,000 people, that's significant. What's the impact of this business of the spent fuel pool and this new information on the SEIS report that we are talking about here tonight? Well it would seem that this new information raises a red flag, and this information has come forward only in recent

years and it's directly applicable to Pilgrim's densely packed spent fuel pool, and it's going to get worse with age, the packing gets more intense. (PNPS-D-W)

Comment: Two, an increase in the density of the pool's fuel rods, three, scientific reports that are fairly recent where everybody is beginning to acknowledge the severe human and environmental impact posed by an accident in a more densely packed pool, especially the above ground type of Pilgrim, I mean that's what's really the problem here. These are fixable problems, however, this is not a statement that we've got to shut the plant down tomorrow, these are fixable problems, but somebody has got to shine a spotlight on them and make sure that we start talking about a plan B, a resolution of these problems.

So I urge you to consider this information for the sake of kids, and my neighbors and the citizens not just of Duxbury where I live, but Plymouth, and Kingston, and Marshfield and places 20 miles beyond where if there was a severe accident, people would be effected for hundreds of miles, actually. (PNPS-D-W)

Comment: The second issue, environmental impact of postulated accidents, that's Section 5, is that right? Thanks. This involves spent fuel and specifically the above ground pool and, again, new and significant information here, no mention of it anywhere. I'm just stunned, absolutely stunned. The issue is that, what are the risks associated with a spent fuel pool accident? And the answer to this question has always been similar to the first one, that the issue has been satisfactorily assessed on a national level with scenarios that assess the possibility of some leakage from the spent fuel pool and, as well, the answer always involves that there will be, there is some normal amount of density of fuel in the pool and that a leakage will result in a manageable scenario. (PNPS-D-W)

Comment: So, summarizing again the second issue of the fuel pool, there is significant and new information, from my perspective, as follows, there is an increased probability of a spent fuel pool attack from the air, there's two very realistic scenarios that are deployable and that hinge on weak points in the building as well as local airstrip safety systems that are inadequate, but I won't discuss those, they are security issues. (PNPS-D-W)

Response: *On site spent fuel storage is considered a Category 1 issue, which was evaluated in the GEIS, NUREG-1437; therefore, accidents would be included within the analysis of the Category 1 issue of on site spent fuel storage. The safety and environmental effects of spent fuel storage on site have been evaluated by the NRC and, as set forth in the Waste Confidence Rule (10 CFR 51.23), the NRC generically determined that such storage could be accomplished without significant environmental impacts. In the Waste Confidence Rule, the Commission determined that spent fuel can be safely stored onsite for at least 30 years beyond the plants life, including license renewal. The GEIS, NUREG-1437, is based upon the assumption that storage of the spent fuel on site is not permanent.*

The issue of security and risk from malevolent acts at nuclear power plants is considered out of the scope of the environmental review and was addressed in the September 26, 2006, Pilgrim Nuclear Power Station Scoping Summary Report (ADAMS Accession No. ML062710517). These matters will continue to be addressed through the ongoing regulatory oversight process as current and generic regulatory issues that affect all nuclear facilities. Appropriate safeguards and security measures have been incorporated into the site security and emergency preparedness plans. Any required changes to emergency and safeguards contingency plans related to terrorist events will be incorporated and reviewed under the operating license.

It should be noted that the Massachusetts Attorney General is currently petitioning the NRC for rulemaking regarding the evaluation of environmental impacts of severe spent fuel pool accidents. Information regarding the Massachusetts Attorney General's rulemaking petition, can be found at the following NRC website: http://ruleforum.llnl.gov/cgi-bin/rulemake?source=prm5110&st=petitions-a.

The comments are noted, but do not provide new information. Therefore, no changes have been made to the SEIS.

Comment: Draft Supplemental GEIS should incorporate the Commission's decision to consider the issues raised by the Attorney General's Scoping Comments and Hearing Request in a generic rulemaking proceeding. The Commission initiated the rulemaking proceeding in November of 2006 by publishing the Attorney General's August 29, 2006 rulemaking petition in the Federal Register for public comment. It is therefore premature for the Draft Supplement GEIS to reach any conclusions regarding the environmental impacts of high-density pool storage of spent fuel at the Pilgrim nuclear power plant. (PNPS-D-HH)

Comment: As stated in our Scoping Comments, the Supplemental GEIS for the Pilgrim nuclear power plant should address the environmental impacts of a severe accident in the Pilgrim fuel pool, including accidents caused by equipment failures, natural disasters, and intentional malicious acts. The Supplemental GEIS should also consider a reasonable array of alternatives for avoiding or mitigating the impacts of a severe pool fire, including combined low-density pool storage and dry storage of spent fuel. (PNPS-D-HH)

Comment: We hereby renew the Attorney General's June 15, 2006, comments on the scope of the Draft Supplemental GEIS, including our previous request that you consider the technical information contained in the Hearing Request which was attached to our Scoping comments. Our Scoping Comments were summarily dismissed in the NRC Staff's September 26, 2006, scoping decision and ignored in the Draft Supplemental GEIS. (PNPS-D-HH)

Response: *The comments are related to the comments provided by the MassAG to the NRC during the hearing request and Scoping period regarding the evaluation of environmental impacts of a severe spent fuel pool accident. On site spent fuel storage is considered a*

Category 1 issue, which was evaluated in the GEIS, NUREG-1437; therefore, accidents would be included within the analysis of the Category 1 issue of on site spent fuel storage. The safety and environmental effects of spent fuel storage on site have been evaluated by the NRC and, as set forth in the Waste Confidence Rule (10 CFR 51.23), the NRC generically determined that such storage could be accomplished without significant environmental impacts. In the Waste Confidence Rule, the Commission determined that spent fuel can be stored onsite for at least 30 years beyond the plants life, including license renewal. The GEIS, NUREG-1437, is based upon the assumption that storage of the spent fuel on site is not permanent. In addition, the NRC staff did not find any new and significant information that would call the Category 1 issue, raised by the MassAG, into question. Therefore, they were not evaluated as part of the DSEIS.

The MassAG is currently petitioning the NRC for rulemaking regarding the evaluation of environmental impacts of severe spent fuel pool accidents. Information regarding the MASSAG's rulemaking petition, can be found at the following NRC website: http://ruleforum.llnl.gov/cgi-bin/rulemake?source=prm5110&st=petitions-a

These comments provide no new and significant information. Therefore, no changes have been made to the SEIS.

A.2.11 Comments Concerning Alternatives

Comment: One particular point of concern is NRC's conclusion that the alternatives to relicensing would have a significantly higher negative impact on the environment than relicensing. In Section 8.2.5.11, NRC downplays the potential of using energy efficiency to replace Pilgrim's capacity, citing federal and state forecasts that incorporate conservation measures and still show rising demand over the next several decades. The assumption that energy efficiency cannot reverse the trend of rising demand is incorrect. Efficiency is becoming far more widely accepted as an alternative to supply, and New England is poised to ramp up efficiency investments significantly. Current regulatory barriers to efficiency will likely begin to fall as well - as they did last year in Rhode Island, when the state adopted legislation that will require utilities to look at efficiency as a cheaper alternative to supply. The low costs of efficiency - approximately 1/3 the cost of wholesale power - are no small reason for newfound enthusiasm in the region. *["Energy Efficiency: The Smart Way to Reduce Global Warming Pollution in the Northeast." National Association of the State PIRGS. August 2005.]*

In considering the alternatives to relicensing, NRC should consider a scenario with greatly expanded energy efficiency investments in the region. As proposed in Section 8.2.6, efficiency could be combined with other alternatives to replace Pilgrim's capacity. (PNPS-D-FF, PNPS-D-GG, PNPS-D-KK)

Response: *As the comment suggests, the NRC did evaluate an alternative that assumed 115 MW (e) of PNPS output would be replaced by conservation or energy efficiency measures (see*

Section 8.2.6 Combination of Alternatives).The NRC's view on this matter is stated in the DSEIS Section 1.4 and reads as follows "Although a licensee must have a renewed license to operate a reactor beyond the term of the existing OL, the possession of that license is just one of a number of conditions that must be met for the licensee to continue plant operation during the term of the renewed license. Once an OL is renewed, State regulatory agencies and the owners of the plant will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners."

The report cited by the commenter (Energy Efficiency: The Smart Way to Reduce Global Warming Pollution in the Northeast, National Association of State PIRGS, August 2005) highlights the potential advantages of energy efficiency compared to practices and policies that allow energy demand to grow, thus requiring existing and new fossil fuel based facilities. Local and regional decision makers may analyze these with other pertinent factors when deciding how to best address regional energy needs. The comment is noted. However, the comment does not provide any new information and no changes have been made to the SEIS.

Comment: Please use common sense and plan to shut down Pilgrim Nuclear in five years! Just think.....Roughtly 50 square miles of solar arrays can provide enough electricity to meet all of the electrical needs of the United States of America! One thing we already have is plenty of desert out west and penty of rooftops in our towns, cities and countryside. The Chinese are already constructing the basic materials for capture of sunlight. PYRON AND BOEING and others are already under contract in other countries to establish colar power collector arrays so that Denmark and other countries do not have to rely on nuclear power of the oil giants. (Nuclear power is NOT cheap.) (PNPS-D-AA)

Response: *The Department of Energy in their Energy Outlook 2006 (page 81) and Energy Outlook 2007 (page 85) state that grid connected solar generation will remain at 0.1 percent of total US generation through 2030. However, they do state that small-scale customer-sited applications will grow rapidly. The Staff's view is that in the long range solar power systems will make an important contribution to U.S. energy supplies but that solar systems are not expected to be a feasible replacement for the base load output of PNPS. Therefore, no changes have been made to the SEIS.*

Comment: I am an advocate of nuclear power and am in there midst of putting together a program to include the potential of nuclear plants being part of the transition from carbon based technologies to hydrogen over the next twenty years. Instead of defending the past and the current maybe it would do you folks a great bit of good if you were positioning yourselves against your adversaries for the future at the same time speaking their language, How can a no - nuke disregard programs eliminating green house gases and creating an overall better environment.

For example !!! Nuclear facility production of hydrogen for alternative fuel programs based on hydrogen resulting from the process could power all the cars in the future. Not to mention

create an alternative power source for all carbon based proposals. I understand you've lived this tale before but maybe it will help with the new (consumer) awareness of global warning that's supposedly leading the charge to new technologies.

I would like to discuss the potential of the Plymouth facility being the catalyst for the production of hydrogen fueling the alternative fuel movement. My background in sensors and respiratory protection programs has afforded me a unique view into the suppliers of energy, their curses and their opportunities. (PNPS-D-BB)

Response: *As noted in the DSEIS Section 8.2.3, the NRC has certified four new standard designs for nuclear power plants. Should applications to construct plants, based on these certified designs, be approved, additional off-sets of greenhouse gases from combustion of fossil fuels would occur. The commenter's suggestion relative to using the nuclear power plants to generate hydrogen is not applicable to PNPS which has been designed solely for electric generation, and no changes have been made to the SEIS.*

Comment: Surely the development of SOLAR CELLS cannot be MORE expensive to develop and maintain than the life span of a nuclear power plant. Solar will be "on line", pardon the pun, in the next 10 years.

PYRON-SOLAR (San Diego, CA) has teamed up with BOEING-SPECTRALAB to create a solar arrray of glass magnifying lenses that gather sunlight and focus it onto a photovoltaic panel which creates direct current to split water into hydrogen and oxygen...with a 37 % to 40% efficiency!

YES it used a lot of energy to produce this array. BUT it uses the sun for fuel thereafter. And sunlight is cheap. SEE: info@pyronsolar.com SEE: www.lionhellas.com. See: info@freedomenergysolutions.com There are many more sites to peruse. SOLAR ENERGY IS CHEAP, ALONG WITH WIND, WATER AND TIDE.

I could go on and on (the readers of this, if any, probably would agree!) However..... MY POINT IS that, yes, the United States has a great deal of electricity generated by nuclear power but now with computers, nanotechnology, world-wide research and growth in solar, wind, water, and tidal power....once these really get going the world will not need to accumulate the tragically dangerous wastes of nuclear power and ,hopefully, NOT those from nuclear weapons! (DO TELL, IS THERE A CONNECTION BETWEEN NUCLEAR "POWER" AND NUCLEAR WEAPONRY?)

(Hmmmmm.)

The power of the future is not radioactive. It is simple, free and there is no end to it. SUN, WINDS, WATER, AND TIDAL POWERS ARE CHEAP, once the initial development price has been paid. A great deal of research is underway which continually makes sustainable energy sources increasingly "cheap" and increasingly available. (PNPS-D-AA)

Comment: But I feel it's common sense to start the process to truly clean and probably in the long run will be cheaper-type energy. The solar array that I just mentioned is 40 percent efficient and already solar energy is down to about $2 kilowatt, if my, I'm not sure if I'm right on that, but it's been cut in half, it was $4, now it's down to $2 and it's heading for a cheaper and cheaper base level. (PNPS-D-C)

Comment: Over in China, there is a country that's already on the New York Stock Exchange and they are getting into cheaply making silicon-type -- I don't have my notes with me -- voltaic cells and so forth. (PNPS-D-C)

Comment: In California, there is many, many companies, one that comes to my mind is Pyron, which is connected with Boeing Spectrolab, and they have made and designed an array of glass, magnifying glass, small cubic-type things, I can't explain it, and a 25-foot diameter array which focuses the sun's energy onto voltaic-type generators. And it seems to me that, in the long run, the world has to turn to materials and processes that do not involve radioactive materials which are dangerous, no matter what you say about how they decompose… (PNPS-D-C)

Response: *As stated in the DSEIS Section 9.3, the NRC Staff's preliminary recommendation is that "the adverse environmental impacts of license renewal for PNPS are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable." The comments refer to the possibility that there are less expensive energy alternatives than continued operation of PNPS. It is the Staff's expectation that regional energy planners are in the best position to recognize the economics of PNPS in relationship to those of renewable energy alternatives and to then undertake the appropriate course of action in light of the energy needs of the Commonwealth. The comments are noted, but do not provide any new information and no changes have been made to the SEIS.*

Comment: And then also I just want to comment that I was surprised to see the broad-brushed conclusion that alternatives to relicensure have moderate to large impacts necessarily, I mean that's obvious of course with fossil fuel plants but with alternatives, including renewables but especially efficiency and conservation, it's very hard to argue that the impacts would be anywhere close to large in terms of negative environmental and health impacts and, when you are talking about cost effective, I mean that's obviously the way to go. (PNPS-D-S)

Response: *It is correct to say that the DSEIS identified large impacts associated with several of the alternatives to PNPS. For instance, land requirements for a coal burning generating facility would be extensive and, therefore, impacts to land use and terrestrial ecology would be expected to be moderate to large if a coal burning alternative were built (DSEIS Section 8.2.1). Furthermore, land requirements for a renewable energy system based on wind power would also be substantial resulting in potentially large terrestrial impacts (DSEIS Table 8-8).*

However, it is not correct to say that the DSEIS ascribes moderate to large impacts to alternatives that involve energy efficiency and conservation measures. The discussion in the DSEIS Section 8.2.5.10 addresses conservation. That section questions the viability of replacing PNPS by conservation measures in an environment of increasing demand for

electricity but there is no suggestion of negative environmental impacts being associated with conservation measures. The comment is noted, but does not provide any new and significant information and no changes have been made to the SEIS.

Comment: The alternatives section discussed wind, it dismissed hydro power and although I'm not an advocate for damming our rivers and increasing hydropower, I would be curious to see an alternatives analysis given to the tidal usage of the Cape Cod Canal. (PNPS-D-I)

Response: *Hydropower is discussed in DSEIS Section 8.2.5.4. That section discusses conventional hydropower, i.e., energy being derived from rivers that have been dammed to create an elevated water surface (a lake) that can potentially be used to drive a turbine. A kinetic hydropower turbine relies on natural currents that occur across tidal channels and straights. Cape Cod Canal may be a potential site for a kinetic type hydropower development though it is expected that the output of such a project would be relatively modest when compared to the base load output of PNPS. It appears that the first such project in the U.S. is being developed in New York City's East River by Verdant Power (http://www.verdantpower.com/initiatives/currentinit.html; http://www.msnbc.msn.com/id/18096246/). Currently in a testing phase, the project is designed to eventually produce up to 10 MW, or enough electricity for approximately 10,000 homes.*

The comment is noted, but does not provide any new and significant information. Therefore, no changes have been made to the SEIS.

Comment: The fusion power plants, such as is being built in Europe, probably is a better answer in the long run, but it's going to cost billions of dollars. (PNPS-D-C)

Response: *The staff did not consider fusion power to be an alternative to PNPS because that technology is not sufficiently developed to evaluate its environmental and other implications. More information of fusion energy systems can be found in the report of the "U.S. Climate Change Technology Program - Technology Options for the Near and Long Term", August 2005 (accessed at www.climatetechnology.gov/library/2005/tech-option).*

Furthermore, "Annual Energy Outlook 2007 - With Projections to 2030" does not mention fusion technology, which strongly suggests that fusion technology is not expected to make a significant contribution to energy supplies prior to 2030. The staff has concluded that a power plant generating electricity using fusion as its energy source is not a feasible alternative to replace the output of PNPS.

A.2.12 Comments Concerning Editorial Issues

Comment: Page 4-69, Line 2 - Suggest deleting "and" between "may" and "as" to correct a typographical error. (PNPS-D-MM)

Comment: Page 4-55, Line 19 - Suggest changing "Figure 2-13" to "Figure 2-12" since "Figure 2-13" shows facility layout and not low-income block groups. (PNPS-D-MM)

Comment: Page 4-55, Line 7 - Suggest changing "percent" to "percentage" to correct a typographical error. (PNPS-D-MM)

Comment: Page 4-38, Line 16 - Suggest changing "Figure 2-5" to "Figure 2-6" since "Figure 2-5" shows the intake structure and not the transmission ROW (right of way). (PNPS-D-MM)

Comment: Page 4-23, Line 8 - Suggest changing "Figures 2-10 and 2-11" to "Figures 2-9 and 2-10" since reference to "Figure 2-11" is incorrect. (PNPS-D-MM)

Comment: Page 2-108, Lines 16, 18, and 28 - Suggest using Town of Plymouth or Plymouth, rather than Plymouth Town. (PNPS-D-MM)

Comment: Page 4-54, Line 33 - Suggest changing "Figure 2-12" to "Figure 2-11" since "Figure 2-12" shows low-income populations and not minority block groups. (PNPS-D-MM)

Comment: Page 2-26, Line 35 - Line 35 needs to be deleted since it is currently an empty space and separates a continuing sentence. (PNPS-D-MM)

Comment: Page 8-47, Line 8 - Suggest changing "powerbock" to power block" to correct typographical error. (PNPS-D-MM)

Comment: Page 2-1, Lines 24-25 - Plant nominal ground level is 23 ft. above MSL. Thus most major structures are situated at or above 23 ft. MSL. (PNPS-D-MM)

Comment: Page 2-4, Line 5 - The plant is accessed via Power House Road. It is no longer called Edison Access Road. (PNPS-D-MM)

Comment: Page 2-7, Line 12 - Suggest deleting the space after "MSL". (PNPS-D-MM)

Comment: Page 2-7, Lines 18-19 - The sentence "Debris and large, impinged organisms are removed from the bar racks using mechanical rake." should be changed to read "Debris and large, impinged organisms are removed from the bar racks using divers." Since the mechanical rake is not currently used. (PNPS-D-MM)

Comment: Page 9-10, Line 17 - Suggest changing "MODERATE" under Natural Gas-Fired Generation Alternate Greenfield Site column to "SMALL to MODERATE" since Line 11 of Page 8-28 states "SMALL to MODERATE" for siting at PNPS or an alternate Greenfield site". (PNPS-D-MM)

Comment: Page 2-9, Lines 12-14; Page E-60, Lines 33-35 - Suggest changing the sentence "Since the chlorination events ... only one pump." to "Condenser chlorination is usually conducted only when both circulating water pumps are running." (PNPS-D-MM)

Comment: Page 2-13, Line 30 - The word should be "Thermex", not "thermix". Page 2-17, Lines 8-10 - These 3 lines are an exact repeat from the previous paragraph (lines 2-5). (PNPS-D-MM)

Comment: Page 2-17, Line 30 - Typo - "resuse" should be "reuse" (PNPS-D-MM)

Comment: Page 2-21, Line 3 - Suggest deleting the redundant "the" in the sentence "The Entergy-owned property boundary, including the PNPS site and the woodlands tract, is shown in Figure 2-3." (PNPS-D-MM)

Comment: Page 2-22, Line 30 - Suggest changing "and NPDES permit" to "a NPDES permit". (PNPS-D-MM)

Comment: Page 2-117, Line 18 - Suggest changing "Figure 2-12" to "Figure 2-11" to accurately reflect location of minority populations. Figure 2-12 shows low-income populations only. (PNPS-D-MM)

Comment: Page 2-25, Line 19 - Suggest changing "50.751 (g)" to "50.75(g)(1)" to accurately reflect the regulatory citation. (PNPS-D-MM)

Comment: Page 2-170, Lines 18-19 - A space should be added between Lines 18 and 19. (PNPS-D-MM)

Comment: Page 2-42, Lines 32-34 - The wording "approximately several miles" in the sentence "Jones River, located approximately several miles north of PNPS, has its headwaters in Pembroke, Kingston, and Plympton before it empties into Plymouth Harbor (Lawton et al. 1990 in ENSR 2000)." should be reworded. Suggest approximately" be deleted from this sentence. (PNPS-D-MM)

Comment: Page 2-50, Lines 31-33 - Suggest inserting the wording "due to the breakwater walls providing an ideal habitat' after "grounds" and "therefore" between "habitat and "cunner" so that the sentence reads "The PNPS area is a cunner spawning and nursery grounds due to the breakwater walls providing an ideal habitat; therefore, cunner have a high incidence of entrainment and impingement at PNPS relative to other species (Lawton et al. 2000)." This would be a more accurate statement of facts whereas the draft wording could be mis-leading. (PNPS-D-MM)

Comment: Page 2-58, Lines 15-17 - Suggest deleting the sentences "Rock gunnel larvae have been collected in the PNPS entrainment sampling." and "Juveniles and/or adults have also been observed in the PNPS impingement sampling program." since these are repeats of the previous two sentences. (PNPS-D-MM)

Comment: Page 2-83, Line 11 - "RWQCB 2004" should be changed to "CRWQCB 2004" to accurately reflect "California Regional Water Quality Control Board". (PNPS-D-MM)

Comment: Page 2-85, Line 22 - Suggest deleting the comma after "Prescott". (PNPS-D-MM)

Comment: Page 2-85, Line 28 - Suggest deleting the "t" after "to". (PNPS-D-MM)

Comment: Page 2-109, Line 18 - Suggest deleting the comma between "Commission" and "2003". (PNPS-D-MM)

Comment: Page 2-111, Line 11 - Suggest using Town of Barnstable or Barnstable, rather than Barnstable Town. (PNPS-D-MM)

Comment: Page 4-78, Line 17 - Suggest changing "Entergy Cultural Resources Procedure" to "Environmental Reviews and Evaluations" to accurately reflect the title of the procedure. (PNPS-D-MM)

Comment: Page 2-126, Line 37 - Suggest changing "Route 3a" to "Route 3A". (PNPS-D-MM)

Comment: Page 2-134, Line 32 - Suggest changing "RWQCB" to "CRWQCB" to accurately reflect "California Regional Water Quality Control Board". (PNPS-D-MM)

Comment: Page 2-161, Lines 11-12 - A space should be added between Lines 11 and 12. (PNPS-D-MM)

Comment: Page 2-161, Lines 15-16 - A space should be added between Lines 15 and 16. (PNPS-D-MM)

Comment: Page 2-25, Line 1 - Suggest changing "100 mg/L" to "1000 mg/L" to accurately reflect the limitations outlined in the PNPS Groundwater Discharge Permit. (PNPS-D-MM)

Comment: Page G-1, Line 20 - Remove ":" (PNPS-D-MM)

Comment: Page 8-37, Line 21 - Suggest changing "MODERATE" under the Impact Column to "SMALL TO MODERATE" since Line 8 of Page 8-36 states "SMALL TO MODERATE". (PNPS-D-MM)

Comment: Page 9-10, Line 19 - Suggest changing "MODERATE" under the New Nuclear Generation Alternate Greenfield Site column to "SMALL to MODERATE" since Line 8 of Page 8-36 states "SMALL to MODERATE". (PNPS-D-MM)

Comment: Page E - Appendix E has three subsections, all labeled Appendix E with no subsection designations. Two of these subsections use the same numbering scheme (e.g. Section 1.0 on Pages E-22 and E-51). The Appendix E subsections should have unique designators such that two different sections of the report do not have the same designator (e.g. Appendix E Section 1.0). (PNPS-D-MM)

Comment: Page 5-3, Line 32 - Suggest deleting "NRC 1996." Footnote on page 5-1 states that all GEIS references are to the GEIS and Addendum 1. (PNPS-D-MM)

Comment: Page 8-30, Line 18 - Suggest changing "MODERATE" for Alternate Greenfield Site column to "SMALL to MODERATE" since Line 11 of Page 8-28 states "SMALL to MODERATE" for siting at PNPS or an Alternate Greenfield Site. (PNPS-D-MM)

Comment: Page 8-30, Line 14 - Need a space above Line 30. (PNPS-D-MM)

Comment: Page 5-6, Line 30 - Suggest changing "equivalents (person-rem)" to "equivalent man (person-rem)". (PNPS-D-MM)

Comment: Page 8-29, Line 29 - Need a space above Line 29. (PNPS-D-MM)

Comment: Page G-8, Line 25 - Suggest inserting "(Entergy 2006b)" after "was evaluated." (PNPS-D-MM)

Comment: Page 8-29, Line 28 - Suggest changing "powerbock" to "power block" to correct a typographical error. (PNPS-D-MM)

Comment: Page 8-30, Line 19 - Need a space above Line 19. (PNPS-D-MM)

Comment: Page 8-21, Lines 18-19 - Need a space between Lines 18 and 19. (PNPS-D-MM)

Comment: Page G-4, Line 9 - Suggest changing "equivalents (person-rem)" to "equivalent man (person-rem)". (PNPS-D-MM)

Comment: Page 4-85, Line 1 - Suggest adding a period after "2006c" to correct a typographical error. (PNPS-D-MM)

Comment: Page 5-5, Line 6 - Suggest changing SAMAs to SAMA. (PNPS-D-MM)

Comment: Page G-9, Line 16 and 21 - Suggest inserting "Exchanger Room" after "Heat". (PNPS-D-MM)

Comment: Page G-12, Line 29 - Suggest changing "w" to "was". (PNPS-D-MM)

Comment: Page G-13, Line 2 - Suggest changing "one percent increase" to "two percent increase". (PNPS-D-MM)

Comment: Page G-16, Line 10 - Suggest inserting "components" after "rugged". (PNPS-D-MM)

Comment: Page G-16, Lines 13-14 - Suggest deleting the sentence "One block wall included in the list of important faults has a conservatively determined capacity of 1.06 g." This information was not included in reference Entergy 2006b and does not belong in this paragraph. (PNPS-D-MM)

Comment: Page G-23, Lines 12-14 - Suggest deletion of "are completely eliminated" from assumptions statement since it is redundant. (PNPS-D-MM)

Comment: Page G-28, Line 25 - Suggest adding "benefits and" prior to "costs" since the response to RAI 5.e changed both the benefits estimate and the cost for SAMA 27. (PNPS-D-MM)

Comment: Page G-32, Line 23 - Suggest changing "$4.5M" to "$4.6M" since $914,000 x 5 = $4,570,000. (PNPS-D-MM)

Comment: Page E-2, Line 9 - The current DOT registration number is No. 053006 550 0050. It was issued 5/30/2006 and expires 6/30/2007. (PNPS-D-MM)

Comment: Page E-2, Line 13 - The current Depredation Permit (#MB831184-0) was effective on 7/1/2006 and expires 6/30/2007. (PNPS-D-MM)

Comment: Page E-3, Line 12 - The issue and expiration dates need to be updated for Materials License 49-0078. The current license was issued May 11, 2006 and expires May 31, 2011. (PNPS-D-MM)

Comment: Page E-4, Line 11 - The issue and expiration dates need to be updated for Tennessee Radioactive Waste license-for-Delivery T-MA004-L01. The current license number is T-MA004-L07, was issued 12/5/2006 and expires 12/31/2007. (PNPS-D-MM)

Comment: Page E-4, Line 5 - The issue and expiration dates need to be updated for South Carolina Radioactive Waste Transport Permit 0007-20-1. The current permit number is 0007-20-07-X, was issued 12/12/2006 and expires 12/31/2007. (PNPS-D-MM)

Response: *These comments are editorial in nature and will be incorporated as appropriate.*

Comment: Page 4-86, Lines 13-14 - The "U.S. Census Bureau (USCB) 2001" reference is not in the Section 4.0 write-ups. (PNPS-D-A)

Comment: Page G-16, Line 9 - Suggest inserting "(Entergy 2006b)" after "potential SAMAs." (PNPS-D-MM)

Comment: Page G-4, Line 6 - Suggest changing "(NRC 1997b)" to "(NRC 1997a)". (PNPS-D-MM)

Comment: Page 2-143, Lines 15-16 - The "Hart 2001" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-157, Lines 18-19 - The "New England Fishery Management Council (NEFMC) 1999" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-150, Lines 21-23 - The "Massachusetts Office of Coastal Zone Management 2006" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-145, Lines 37-38 - The "Kocik and Brown 2001" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-144, Lines 19-20 - The "Idoine, J. Undated" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-143, Lines 37 and 40 - Suggest changing "Hendrickson, L. 2000" to "Hendrickson, L. 2000a" to match write-ups. (PNPS-D-MM)

Comment: Page 2-155, Lines 31-33 - The "National Marine Fisheries Services (NMFS) 2006e" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-151, Line 8 - Suggest changing "1998" to "1998b" to match write-ups in the DSEIS. (PNPS-D-MM)

Comment: Page 2-161, Lines 5-6 - The "Pava et al. 1997" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-167, Lines 33-34 - The "Town of Plymouth 2006c" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-167, Lines 18-20 - The "Toner 1984b" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-166, Lines 5-6 - The "Stevenson 1936" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-163, Lines 12-14 - The "Salerno et al. 2001" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-162, Lines 38-39 - Suggest changing "1986a" to "1986" to accurately reflect the listing in the Section 2.2.5 write-up. (PNPS-D-MM)

Comment: Page 2-162, Lines 5-7 - The Reid et al. 1999a reference is a repeat of the reference shown on Lines 17 - 19. (PNPS-D-MM)

Comment: Page 2-156, Lines 39-41 - The "Neilson 1986" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-41, Lines 28-29 - Suggest changing "Cargnelli 1999e" to "Cargnelli, et al. 1999e" since the Section 2.3 references does not list a reference only for Cargnelli 1999e. (PNPS-D-MM)

Comment: Page 2-157, Lines 4-6 - The "New England Fishery Management Council (NEFMC) 1987" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-160, Line 18 - Suggest changing "Cadri" to "Cadrin" to reflect accurate spelling. (PNPS-D-MM)

Comment: Page 2-160, Lines 1-3 - The "Olsen and Merriman 1946" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-159, Lines 1-4 - The "Nuclear Regulatory Commission (NRC) 2006" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-158, Lines 29-31 - The "Nuclear Regulatory Commission (NRC) 1996" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: 2-157, Lines 21-23 - The "New England Fishery Management Council (NEFMC) 2003a" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-129, Line 26 and 30 - Suggest changing "ACE 2006" to "USACE 2006" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-161, Lines 29-31 - This reference is incorrect. The referred to document is email correspondence between Jill Brochu at Entergy and Robert Prescott. It is not available at the location noted. Also Robert Preston is employed at the Massachusetts Audubon Society, not the Provincetown Center for Coastal Studies. If the reference is for the fish study which has somehow been included, Robert Prescott is not the author and the date of 1/15/2005 would be incorrect. (PNPS-D-MM)

Comment: Page 2-84, Line 25, Page 2-87, Lines 8 and 14 - Although there are "NHESP 2006a" and "NHESP 2006b" listings in the Section 2.3 references, there is no "NHESP 2006" listing only. (PNPS-D-MM)

Comment: Page 2-69, Line 19 - Although there are "NEFMC 2006a" and "NEFMC 2006b" listings in the Section 2.3 references, there is no "NEFMC 2006" listing only. (PNPS-D-MM)

Comment: Page 2-73, Line 4 - Although there are "Cadrin 2000a" and "Cadrin 2000b" listings in the Section 2.3 references, there is no "Cadrin 2000" listing only. (PNPS-D-MM)

Comment: Page 2-73, Lines 12 and 21 - Suggest changing "Cooper et al. 1998" to "Cooper and Chapleau 1998" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-73, Line 21 - There is no "DFO 1997" listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-74, Line 10 - Suggest changing "Brodziak et al. 1996" to "Brodziak and Macy 1996" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-74, Line 18 - There is no "Cargnelli et al. 1999" listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-74, Lines 32, 34 and 40 - Suggest changing "Hendrickson 2004" to "Hendrickson and Holmes 2004" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-76, Line 10 - There is no "Anjaru 1964" listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-78, Line 36 - There is no "Matthiessen 1984" listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-79, Line 39 - Suggest changing "Hart et al. 2004" to "Hart and Chute 2004" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-80, Line 39 - There is no "NEFSC 2004" listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-80, Line 11 - There is no "Hines 1991" listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-67, Line 10 - There is no "Hendrickson 2000b" listing in the Section 2.3 References. Although there are two "Hendrickson 2000" listings in the Section 2.3 references, neither is listed as "2000b". (PNPS-D-MM)

Comment: Page 2-43, Line 3 - The "McKenzie 1964" reference is not listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-63, Line 18 - The "NFSC 1998" reference is not listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-134, Line 22-23 - The "Cadrin and King 2002" reference is not in the Sections 2.0 - 2.2 write-ups. (PNPS-D-MM)

Comment: Page 2-45, Line 11 - The reference "NMFS 2003" is intended to be either "NFMS 2003a" or "NFMS 2003" based on the references listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-49, Line 15 - The reference "Provincetown Center for Coastal Studies 2006" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-54, Line 24 - The "Woods 1982" reference is not listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-55, Line 22 - The reference "Steimle 1999b" should be changed to "Steimle et al. 1999b" as shown in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-83, Line 22 - "Marine Mammal Protection Act (MMPA) of 1972" should be listed in the Section 2.3 references to be consistent with other regulatory Acts listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-62, Line 30 - The "Terciero 1995" reference is not listed in the Section 2.3 references. Moreover the correct spelling ("Terceiro") appears to be that as identified on Page 2-167 (lines 1-2 and 3-4). (PNPS-D-MM)

Comment: Page 2-83, Lines 32 and 34, Page 2-84, Lines 1, 3, and 10 - The reference "Provincetown Center for Coastal Studies 2006a" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-99, Lines 23-25 - The "Entergy 2006a" reference at the end of the sentence "This program includes the collection, analysis, and evaluation of data in order to assess the radiological impact of PNPS on the environment and on the general public ... " is incorrect since the PNPS Environmental Report did not contain such as statement. (PNPS-D-MM)

Comment: Page 2-93, Lines 34-35, Page 2-97, Line 31, Page 2-98, Line 3 - Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 2.3 references, there is no "FWS 2006" listing only. (PNPS-D-MM)

Comment: Page 2-85, Lines 32 and 34, Page 2-125, Line 25 - Suggest changing "Entergy 2006" to "Entergy 2006a" to accurately reflect the source and listing in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-66, Line 32 - The "Langton and Bowman 1981" reference is not listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-67, Line 39 and 6 - Suggest changing "Chang et al. 199b" to "Chang et al. 1999b". (PNPS-D-MM)

Comment: Page 2-35, Line 38 and Page 2-36, Line 14 - The reference "NEFMC 1998" is intended to be either "NEFMC 1998a" or "NEFMC 1998b" based on the references listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 2-58, Line 32 - The "Morse 1978" reference is not listed in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 4-83, Lines 37-38 - The "Nuclear Regulatory Commission (NRC). 1987" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-81, Lines 31-34 - The "National Academy of Sciences (NAS). 1980" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-91, Lines 36-38 - The "National Academy of Sciences (NAS). 1990" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page G-13, Line 14 - There is no "USDA 1998" listing in the Section G.8 references (Pages G-38 through G-40). (PNPS-D-MM)

Comment: Page 4-66, Line 26 - Suggest changing "Hoffman 1992" to "Hoffman et al. 1992" to accurately reflect the listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-66, Line 26 - Suggest changing "Sever 1993" to "Sever et al. 1993" to accurately reflect the listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-66, Line 17 - There is no "MPDH 1990" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-65, Line 3Suggest changing" ... in NRC 2006a ... " to " ... in NRC 2006a)." to correct a typographical error. (PNPS-D-MM)

Comment: Page 4-63, Line 6 - There is no "NRC 2005" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-63, Lines 1-2; Page 4-67, Line 3; Page 4-67, Line 30 - The Entergy references utilized in this discussion are incorrect since these references are associated with radiological environmental reports and not radioactive effluent release reports which is a separate report that deals with doses. (PNPS-D-MM)

Comment: Page 4-62, Line 14 - There is no "BEIR VII 2005" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-59, Line 22 - There is no "NHESP 2005a" listing only in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-58, Line 29 - There is no "NHESP 2006" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 2-170, Lines 27-29 - Suggest adding "1982." to reflect actual year that material was published and to be consistent with how the reference is listed in the Section 2.2 write-up for the Monkfish (pp. 2-54 to 2-55). (PNPS-D-MM)

Comment: Page 4-82, Lines 36-38 - The "Natural Heritage and Endangered Species Program (NHESP). 1995a" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-81, Lines 27-29 - The "National Academy of Sciences (NAS). 1972" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 5-10, All - For consistency with the other sections suggest adding 10 CFR 50, 10 CFR 51, 10 CFR 54, 10 CFR 73 and 10 CFR 100 to the Section 5.3 References. (PNPS-D-MM)

Comment: Page 2-1, Lines 24 and 32 - There is no "Boston Edison Company 1974" reference in the Section 2.3 references. (PNPS-D-MM)

Comment: Page 4-84, Lines 11-13 - The "Nuclear Regulatory Commission (NRC). 1996b" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-86, Lines 7-8 - The "U.S. Census Bureau (USCB) 1991" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-13, Line 12, Page 4-21, Line 25 and 28 - Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only. (PNPS-D-MM)

Comment: Page 4-51, Line 41 - There is no "OCPC 2000" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-84, Lines 36-37 - The "Nuclear Regulatory Commission (NRC). 2006b" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page G-40, Lines 24-25 - The "Nuclear Regulatory Commission (NRC) 2003" reference is not in the Sections G.1 - G.7 write-ups (Pages G-1 through G-38). (PNPS-D-MM)

Comment: Page 4-50, Line 4 - There is no "MOCZM 2006" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 5-4, Line 21 - Suggest changing "(2006a)" to "(Entergy 2006a)" to reflect the listing in the Section 5.3 References. (PNPS-D-MM)

Comment: Page 8-14, Line 28 - Suggest changing "(USEPA 2000b)" to "(EPA 2000b)" to reflect the listing the Section 8.4 References. (PNPS-D-MM)

Comment: Page 4-30, Line 17; Page 4-58, Line 31 - There is no "Entergy 2006" listing only in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-82, Line 7 - The "National Environmental Policy Act of 1969" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-12, Lines 29 and 33 - Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only. (PNPS-D-MM)

Comment: Page 2-27, Lines 14-15 - The sentence "Massachusetts was designated as being in "moderate nonattainment" of the 8-hour ozone standard in June 2005." should have a reference. (PNPS-D-MM)

Comment: Page 2-100, Line 17 - Suggest changing "Entergy 2003" to "Entergy 2003c" to accurately reflect the source and listing shown in the Section 2.3 References. (PNPS-D-MM)

Comment: Page 4-13, Lines 2 and 5 - There is no "MRI 2000" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-12, Line 38 and 40, Page 4-13, Line 5 - There is no "MRI 2002" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-67, Line 3 - There is no "NRC 2005a" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-86, Lines 1-2 - The "United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-70, Line 32 - There is no "USACE 2006" listing in the Section 4.10 References. (PNPS-D-MM)

Comment: Page 4-12, Lines 21 and 25 - Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only. (PNPS-D-MM)

Comment: Page 4-77, Lines 28-31 - The "Entergy Nuclear Operations, Inc. (Entergy). 2000" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 4-78, Lines 4-7 - The "Entergy Nuclear Operations, Inc. (Entergy). 2005b" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Comment: Page 2-68, Line 21 - The reference "NEFSC 2005" appears to be the source for "Figure 2-7"; however "NEFMC 2006" is listed as the source for "Figure 2-7". Therefore, there appears to be a discrepancy. (PNPS-D-MM)

Comment: Page 4-85, Lines 6-7 - The "Old Colony Planning Council (OCPC). 2000" reference is not in the Section 4.0 write-ups. (PNPS-D-MM)

Response: *These comments are editorial in nature and deal specifically with the references cited in the DSEIS. The references will be reviewed and these comments will be incorporated as appropriate.*

Comment: Page E-15, Line 30 - Apparent error "disch temp diff. ranging from 33.8 - 48 degrees F ... " The typical temperature difference is 26 - 29 degrees F. (PNPS-D-MM)

Comment: Page E-26, Line 9 - Typo "1998 MWt" should be 2028 MWt. (PNPS-D-MM)

Comment: Page E-68, Lines 34-35 - The sentence states "Condenser tubes at PNPS are cleaned by backwashing on a 1 to 2-week interval, depending on the degree of bio fouling." is incorrect. Thermal backwashing is done 4 to 5 times per year. This process was accurately described on Page E-62, 3rd Paragraph, starting at Line 25. (PNPS-D-MM)

Comment: Page E-15, Line 35 - PNPS is not attempting "to offset adverse impacts" by stocking 25,000 winter flounder. It is a pilot program intended to determine the feasibility of this approach (which could be scaled up as needed). (PNPS-D-MM)

Comment: Page E-43, Line 20 - Suggesting adding the clarification that no sturgeon of any type has ever been observed at PNPS; therefore, there has been no chance of mis-identification. (PNPS-D-MM)

Comment: Page E-91, Line 15 - There is no "Bowman et al. 2000" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-62, Lines 19-20 - Based on the PNPS NPDES Permit and Table 2-2, there are no temperature limitations on the service water. Therefore, the sentence "The permitted change in temperature across the service water is 5 to 10°F." is incorrect and should be deleted. Also, suggest adding another space to separate the sentence from the next sentence. (PNPS-D-MM)

Comment: Page E-60, Lines 17-20 - The sentence "The mixture is used to ensure the total residual chlorine discharge concentration does not exceed a maximum daily concentration of 0.10 parts per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge." is incorrect. The Condenser Cooling Water NPDES Permit total residual chlorine limitations are "0.10" maximum daily and "0.1" average monthly. The Plant Service

Cooling Water NPDES Permit total residual chlorine limitations are "1.0" maximum daily and "0.5" average monthly. (PNPS-D-MM)

Comment: Page E-57, Lines 38-39 - The sentence "Debris and large, impinged organisms are removed from the bar racks using a mechanical rake." should be changed to read "Debris and large, impinged organisms are removed from the bar racks using divers." since the mechanical rake is not currently used. (PNPS-D-MM)

Comment: Page E-29, Lines 30-32 - Suggest changing the sentence "Since the chlorination events ... only one pump." to "Condenser chlorination is usually conducted only when both circulating water pumps are running." (PNPS-D-MM)

Comment: Page E-57, Line 1 - There is no "Lawton et al. 1995" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-52, Lines 38-39 - Suggest changing the first sentence of the paragraph to read as follows: "Water depths in the vicinity of PNPS are typically 10ft and up to 120 ft fives miles offshore of the site." (PNPS-D-MM)

Comment: Pages E-102 and E-105, Sections 7.0 and 8.0 - The NRC is not known to have been delegated authority under the Clean Water Act to make recommendations regarding mitigation measures associated with "aquatic matters". In addition, 316(b} is associated with numerical performance standards and does not define "impact'. Mitigation measures in the future, if any, will be developed and jointly agreed upon between USEPA Region I and Entergy as part of the 316(b} compliance process. Therefore, Section 7.0 should be deleted. (PNPS-D-MM)

Comment: Page E-112, Line 21; Page E-118, Line 23 - Suggest changing "1999a" to "1999" to correct a typographical error and to be consistent with how the reference is shown in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-111, Lines 1-2 - Suggest listing all authors for this reference instead of only "Galya et al. 1997" to be consistent with other sections References. (PNPS-D-MM)

Comment: Page E-111, Lines 10-12 - The "Grimes et al. 1986" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-110, Line 31-33 - The "Fahay et al. 1999b" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-112, Lines 1-5 - The "Hendrickson and Holmes 2004" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-114, Lines 36-27 - The "Marak 1973" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-112, Lines 29-30 - The "Kelly and Barker 1961 a" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-110, Lines 1-2 - The "Dooley 1978" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-113, Lines 26-29 - The "Lawton et al. 1984" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-114, Lines 33-34 - The "Marak 1967" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-115, Lines 1-4 - The "Marine Research, Inc. (MRI) 2005a" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-115, Line 6 - Suggest inserting "(MRI)" between "Inc." and "2005b" to correct a typographical error and to be consistent with how the reference is shown in Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-115, Lines 11-14 - The "Marine Research, Inc. (MRI) 2006" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-118, Lines 19-21 - The "Pikanowski et al. 1999" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-108, Lines 35-37 - The "Chang et al. 1999c" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-120, Lines 1-3 - The "Steimle et al. 1999e" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-109, Line 38 - Suggest changing "1988a" to "1998" to correct a typographical error so that the reference is consistent with that shown in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-110, Lines 35-37 - The "Freeman and Turner 1977" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-112, Lines 32-33 - The "Kelly and Barker 1961 b" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-45, Lines 9-11 - The "Fish and Wildlife Service (FWS) 2006e" reference is not in the Sections 1.0 - 6.0 write-ups (Pages E-22 through E-43). (PNPS-D-MM)

Comment: Page E-81, Line 32 - There is no "Deuel 1964" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-47, Lines 18-19 - This reference is incorrect. The referred to document is email correspondence between Jill Brochu at Entergy and Robert Prescott. It is not available at the location noted. Also Robert Preston is employed at the Massachusetts Audubon Society, not the Provincetown Center for Coastal Studies. (PNPS-D-MM)

Comment: Page E-81, Line 32 - There is no "Shepherd 2000b" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-80, Line 35 - There is no "NMFS 2005c" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-80, Line 8 - There is no "Steimle et al. 1999d" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-73 - Line 19 - There is no "NMFS 2005a" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-67, Line 36 - There is no "EPA 1994" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-37, Lines 19, 20, and 23 - Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 7.0 references, there is no "FWS 2006" listing only. (PNPS-D-MM)

Comment: Page E-85, Lines 8-9 - Suggest changing "NOAA 1998a" to "NOAA 1998" to accurately reflect the listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-67, Line 30 - The "Clean Water Act" should be listed in the Section 9.0 references to be consistent with other regulatory Acts listed in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-66, Lines 24 and 41 - Suggest changing "Marine Research, Inc. 2005b" to "MRI 2005b" to be accurate with the listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-45, Lines 32-34 - The "Mass Audubon 2003" reference is not in the Sections 1.0 - 6.0 write-ups (Pages E-22 through E-43). (PNPS-D-MM)

Comment: Page E-45, Lines 36-39 - The "National Marine Fisheries Service (NMFS) 2002" reference is not in the Sections 1.0 - 6.0 write-ups (Pages E-22 through E-43). (PNPS-D-MM)

Comment: Page E-63, Line 13 - There is no "BSC Group 1996" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-51, Line 32 - The "Endangered Species Act" should be listed in the Section 9.0 references to be consistent with other regulatory Acts listed in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-32, Line 11 - There is no "BSC Group 1996" listing in the Section 7.0 References. (PNPS-D-MM)

Comment: Page E-32, Lines 21-22, 24,and 29 - There is no "Entergy 2006a" listing in the Section 7.0 References. (PNPS-D-MM)

Comment: Page E-107, Line 24 - Suggest changing "2000a" to "2000" to correct a typographical error and so that the reference is consistent with what is shown in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-107, Lines 20-22 - The "Burnett et al. 1983" reference is' not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-108, Lines 11-16 - The "Cargnelli et al. 1999f" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-106, Lines 1-3 - The "Able et al. 1982" reference is not in the Sections 1.0 - 8.0 write-ups (Pages E-51 through E-105). (PNPS-D-MM)

Comment: Page E-28, Line 41; Page E-s 22, 28, 30, 37, and 40 - There is no "ENSR 2002" listing in the Section 7.0 References. (PNPS-D-MM)

Comment: Page E-34, Line 18 - Suggest changing the first sentence of the paragraph to read as follows: 'Water depths in the vicinity of PNPS are typically 10ft and up to 120 ft fives miles offshore of the site." (PNPS-D-MM)

Comment: Page E-104, Line 6 - There is no "EPRI 2006" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-34, Line 28 - There is no "EG&G 1995" listing in the Section 7.0 References. (PNPS-D-MM)

Comment: Page E-104, Line 5 - There is no "Siemens 2006" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-89, Line 1 - Suggest changing "Normandeau 206b" to "Normandeau 2006b" to correct a typographical error. (PNPS-D-MM)

Comment: Page E-32, Line 22 - There is no "AEC 1972" listing in the Section 7.0 References. Page E-103, Line 37 - There is no "Earth Tech 2006a" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-32, Lines 29-30, and 31 - There is no "NSTAR 2006" listing in the Section 7.0 References. (PNPS-D-MM)

Comment: Page E-101, Line 26 - Suggest changing "Cooper et a. 1998" to "Cooper and Chapleau 1998" to accurately reflect the listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-100, Lines 22-23 - There is no "Burnett et al. 1992" listing in the Section 9.0 References. (PNPS-D-MM)

Comment: Page E-99, Line 24 - Suggest changing "Scott 1982a" to "Scott 1982" to accurately reflect the listing in the Section 9.0 references. (PNPS-D-MM)

Comment: Page E-98, Line 35 - Suggest changing "Pereira 1999" to "Pereira et al. 1999" to accurately reflect the listing in the Section 9.0 References. (PNPS-D-MM)

Response: *The comments are noted. However, comments regarding Appendix E can not be incorporated since this section is for reference only and includes letters and consultations previously submitted and finalized.*

A.2.13 Comments Concerning Decommissioning Issues

Comment: The staff did not provide information about buried wastes on site - where they were located; how deep they were buried; packaging; chemical and radioactive composition of waste. We know for example that when Pilgrim blew its filters in 1982, there was considerable contamination. During the clean up, waste was buried on the property. Neighbors and passer-bys on Rocky Hill Road observed the operation - NRC and Entergy's staff are aware, too. The public, NRC officials and Entergy staff also are well aware of burials off the Access Road. If the application is approved, decommissioning will not begin until 2032 or later. We assume that the licensee and NRC determined that burying waste on site would not harm the environment based on a definite time frame - a 40 year license. What would happen after 60 years was not considered nor analyzed. It needs to be analyzed to provide reasonable assurance that public health and safety will not be negatively impacted. For example erosion of the top soil will be affected by the passage of time, increasing frequency and severity of coastal storms; and the topography of the site that slants down into Cape Cod Bay. Migration of contaminants underground is currently not monitored. Migration of contaminants from so-called low level waste has happened at other sites - for example, at Barnwell SC, TVA, Hanford and Starmet. Hence there is no reason to believe that the same could not happen here. (PNPS-D-EE)

Response: *The comment is noted. As part of the environmental site audit for license renewal the staff typically reviews records and reports of spills or other occurrences involving the spread of hazardous contaminants as it relates to human health and water use and quality-groundwater. During its review, the staff did not identify any new and significant information within these records that may call the Category 1 issues of human health and water use and quality-groundwater into question. Nevertheless, the requirements for keeping these*

records and retention programs, 10 CFR 50.75(g)(1), are to ensure that these types of areas will be identified during plant decommissioning. In addition, these regulations provide assurance that any contamination will be appropriately remediated during site decommissioning.

Specifically, at the time of decommissioning, the licensee is required to submit a License Termination Plan which contains information on the types and quantities of radioactive materials on the site.

Decommissioning will ensure that all areas of the site, meet the site release criteria specified in 10 CFR Part 20 prior to license termination. In addition, environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license are evaluated in the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NUREG-0586). These decommissioning activities are considered Category 1 issues; and therefore, no changes have been made to the SEIS.

Comment: Five years from now, PILGRIM NUCLEAR PLANT will be five years more mature than it is now. It is one of the model T's of the nuclear industry. It will be time, then, to put it to rest! It will take at least five years to decide just how, indeed, to put it SAFELY to rest so that for the next, say 100 to 400 years, it's radioactive reactor parts and wastes and the surrounding earth will not threaten the diverse life forms of southeastern Massachusetts, Cape Cod and Massachusetts Bay. Please start deciding. (PNPS -D-AA)

Response: *Environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license are evaluated in the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NUREG-0586). This statement can be found at the beginning of Chapter 7. The findings from this GEIS are used to support the findings in the SEIS. The comment provides no additional information; therefore, no changes have been made to the SEIS.*

A.2.14 Comments Outside the Scope of the Environmental Review for License Renewal: Safeguards and Security; Operational Safety; Aging Management; Need for Power; and Energy Costs

Safeguards and Security

Comment: Security standards are inadequate at all the nuclear reactors, and the NRC has deliberately removed security complaints from the re licensing process, just as they have refused to give any serious consideration to a terrorist attack on these vulnerable facilities. (PNPS-D-A)

Comment: The possibility of a terrorist attack on Pilgrim goes well beyond mere speculation. The 9/11 Commission has documented the fact that nuclear facilities had been among the original targets of the al Qaeda terrorists. (PNPS-D-B)

Comment: I have read Chairman Dale Klein's recommendation that future nuclear power plants should include design improvements to better protect against attack by large aircraft. Don't the citizens in our area deserve as much? Today the PNPS is packed with spent fuel rods in a structure designed before the 9/11 attacks, with off site storage of spent fuel highly unlikely. While the concrete walls may withstand an attack, can you assure us that the ceiling is impenetrable? (PNPS-D-DD)

Comment: Risk of sabotage far from "small" - CRAC II Report; NAS Report; MA AGO Motion

The President of the United States, Congress, special commissions all agree that the risk of sabotage to our country is considerable and increasing. Nuclear reactors are prime targets because of the catastrophic consequences a successful attack would bring. Pilgrim is an especially attractive target because of its location in "America's Hometown" - a symbolic target - Plymouth is known around the world. Pilgrim is vulnerable to an attack by the air [even a small explosive laden helicopter could cause a disaster by targeting the switch-yard, control room, intake, not to mention the densely packed spent fuel pool]; sea [a few buoys marking the no-enter zone, floating "No Trespassing" signs, provide no real deterrence; and land [onsite guards depend on off site forces, it is highly unlikely for them to arrive in sufficient time considering that OSRE mock attacks are usually lost in three minutes]; and there are simply not enough guards, trained and equipped, to meet the number of attackers and type of equipment involved in 9/11.

Examples - new and significant information showing risk far from small:

A. Core Melt - Calculation of Reactor Accident Consequences U.S. Nuclear Power Plants (CRAC-2), Sandia National Laboratory, 1982

A core melt at Pilgrim NPS, calculated by the federal government, would result in a 20 miles peak 1st year fatal radius; a 65 miles peak 1st year injury radius; and 23,000 peak cancer deaths.

And new information available since the GEIS is a later analysis of the CRAC study by Dr. Edward Lyman showing that these estimates are conservative ["Chernobyl on the Hudson? - The Health and Economic Impacts of a Terrorist Attack at Indian Point Power Plant," Dr. Edwin Lyman, September 2004]. In the report he concluded,

The federal study, CRAC II:

- used census data from 1970;
- assumed entire 10-mile EPZ would be evacuated within at most six hours after issuance order;
- assumed aggressive medical treatment for all victims of acute radiation exposure in developing numbers for early fatalities;

- used a now obsolete correlation between radiation dose and cancer risk that underestimated the risk by a factor of 4 relative to current models; and current models need to be recalculated again based on the National Academy's BEIR VII Report (June 2005) that reconfirmed that there is no safe level of radiation, risks are greater than previously thought and health risks other than cancer must be considered -such as heart disease and birth defects;
- sampled only 100 weather sequences out of over eight thousand (an entire year's worth), a method that underestimates the peak value over the course of a year by 30%. (PNPS-D-EE)

Comment: While nothing involving terrorism is 100 percent predictable, the often cited vision of a 9/11 style aircraft attack is virtually precluded by the design and layout of the critical plant elements and surrounding structural supports. Similarly, the notion of a frogman entering through the sea water inlet canal and the massive centrifugal cooling water pumps without being homogenized is ludicrous. (PNPS-D-L)

Comment: Important to consider, but it was neglected, was the issue of security, there is site-specific information that you have to consider.

First, vulnerability, what type of protection do they have? There is no protection from an air attack and despite the previous speaker, a helicopter loaded with explosives could cause a severe accident targeting spent fuel, targeting the switch yard, targeting the control room, we don't have to go on, it's an undisputed fact, they are not built to resist an air attack. Security from the water is virtually nonexistent, there are buoys which are floating no trespassing signs, period, explosives can be put up into the canal, that is why Homeland Security recommended a grate for Millstone, which they turned down.

Also, from a land attack, there is no effective security, they are dependent upon outside security arriving. However, the OSRI mock attacks have demonstrated that a force can do the job, hit the target sets in about three minutes, no way the state police, etcetera, are going to get there in three minutes. And neglected and what should be included is the spent fuel pool as being a serious target and a target of serious consequences, which Section 5 discusses that you focus on consequences. (PNPS-D-M)

Comment: I do not need to elaborate on all the ways Terrorists can do harm - but it is easier than you'll ever admit and your test drills are phony and unrealistic. (PNPS-D-PP)

Comment: Now, seriously, who here is concerned about a terrorist attacking a wind farm? So what if they did? You would never have the consequences that we have here. So, because nuclear has been described as cost effective, it's because these true costs are not put into play, it is the most heavily subsidized industry. If you describe it as safe, as former speakers had, it's because you are not looking at what the consequences of either a reactor accident or of a spent fuel accident, God forbid, would be. And if you are looking at is as safe, I think I've already covered that. (PNPS-D-Q)

Comment: The secondary impact of this new information on the SEIS report is that the quantities of radioactive waste are now an attractive target, if they are on-site here, for terrorists who are set on spreading dirty bomb contamination that's going to destroy the environment and harm the health of our citizens, which is what this environmental impact statement is all about. (PNPS-D-W)

Comment: New information, in my opinion, new and significant information never acknowledged in here, number one, 9/11 event, the 9/11 event, plus discovery of nuclear facility files on computers of fundamental terrorist organizations changes everything for me. I think it changes the probability of a, what's referred to in the report as a postulated accident, it changes the scenario that's mapped out as a manageable pool leakage to a pool drainage or, at best, the elimination of circulation of the water in the pool which has, as you'll see, as you'll hear, disastrous consequences.

The national, just to back up to this business about fundamental terrorist organizations, and I'm just not talking off the top of my head based on the headlines in the news, the National Commission on Terrorist Organizations issued a 2004 staff paper suggesting that al Qaeda initially included nuclear power plants among their expanded lists of targets, aside from the World Trade Center, the Pentagon, etcetera, for their 9/11 attacks. So this is a national commission that was put together after 9/11 that stated this.

This new information, again, changes the whole scenario here, it doesn't take a classified intelligence report to figure out how determined individuals could cause these scenarios to take place right from our backyard, the Plymouth Municipal Airport or another nonmonitored airstrip in the region. I think this is also new information. Again, it's come since the GEIS was developed, it's come within just the last few years and it gives us an opportunity to reassess the possibility of a sabotage attempt as a higher possibility or a higher probability than was originally postulated when people went through these scenarios and said this is not an issue.

Prior to 9/11, the NRC had no way of sort of estimating the likelihood of some sort of sabotage at a nuclear facility. As a matter of fact, I'm going to quote from a document, an NRC document, "there is no established method ... for quantitatively estimating the likelihood of a sabotage event at a nuclear facility". This is from a report from the NRC prior to 9/11, June, 2001, a briefing on spent fuel three months prior to 9/11. Since then, again, new information. We have an attack, we have mention of nuclear facilities in al Qaeda documents and I think immediately even a statistician, who knows nothing about terrorism, says, oh, we have a probability, we have some probability we can estimate, so this is new information. (PNPS-D-W)

Response: *The issue of security and risk from malevolent acts at nuclear power plants is beyond the scope of license renewal. These matters will continue to be addressed through the ongoing regulatory oversight process as current and generic regulatory issues that affect all nuclear facilities. Appropriate safeguards and security measures have been incorporated into the site security and emergency preparedness plans. Any required changes to emergency and safeguards contingency plans related to terrorist events will be incorporated and reviewed*

under the operating license. [See "Amergen Energy Co, LLC (Oyster Creek Nuclear Generating Station), CLI-07-8, 65 NRC-124 (February 26, 2007, ADAMS Accession No. ML070570511)]. These comments provide no new information and no changes have been made to the SEIS.

Comment: In California it has been ruled that the threat of terrorist attack should be considered by the NRC in deciding on the licensing of nuclear facilities. Why don't the citizens of Massachusetts deserve the same consideration and protection? I agree with the Union of Concerned Scientists in their stand on the realistic revision of security regulations. (PNPS-D-DD)

Comment: In addition, we wish to inform you that on January 16, 2007, the U.S. Supreme Court denied a petition for review of a decision by the U.S. Court of Appeals for the Ninth Circuit that was cited in our Scoping Comments, San Luis Obispo Mothers for Peace v. Nuclear Regulatory Commission, 449 F.3d 1016 (9th Cir. 2007). The decision is reported at 2007 U.S. LEXIS 1028. (PNPS-D-HH)

Comment: The 9th Circuit Court in California faced the question of whether the NRC needs to consider terrorism in licensing decisions under NEPA, they concluded that in fact they did. This is an important licensing decision. The industry in California went to appeal to the Supreme Court and the Supreme Court decided not to hear it which indicates they gave their blessing to the decision. So these two factors, therefore, that being terrorism, security and the spent fuel pool under postulated accidents must be considered if you are going to do an honest job. (PNPS-D-D)

Comment: DSEIS concluded that, "Additionally the NRC regulatory requirements under 10 CFR Part 73 provides reasonable assurance that the risk of sabotage is small."
NRC did not consider new and significant information specific to this site; no reasonable person would agree that NRC regulatory requirements "provide reasonable assurance that the risk of sabotage is small."

Massachusetts listed among top 5 terrorist targets

In, Arab-American to become first Massachusetts homeland security chief, David Weber, Associated Press, January 21, 2007 states, The federal government lists Massachusetts -- where two of the planes involved in the 9-11 attacks were launched from Logan International Airport -- among the five states most likely to be involved in attacks.

Ninth Circuit Court - San Luis Obispo Mothers for Peace v. Nuclear Regulatory Commission, June 21, 2006 contradicts NRC Staff. The court dealt with the question of whether the NRC must address impacts of terrorist attacks in licensing decisions under National Environmental Policy Act - the court concluded that it did. Although technically the court's decision does not have to be applied here, practically it does. The NRC deals with most issues generically. Therefore how can NRC turn around and say it applies in California but not in Massachusetts?

The Court found that: the risk of a terrorist attack is not too speculative for consideration under NEPA; the numeric probability of a terrorist attack need not be precisely quantifiable in order for its potential environmental impacts to be considered; the NRC erred by characterizing Petitioners' request as a demand for a "worst-case" analysis when Petitioners did not ask the NRC to engage in conjecture on the worst-case outcome, but instead sought an analysis of the likely range of environmental impacts if an attack occurred;"[t]here is no support for the use of security concerns as an excuse from NEPA's requirements.

The US Supreme Court, January 16, 2007, refused to review the Ninth Circuit's ruling that, in order to comply with the National Environmental Policy Act (NEPA), the NRC must consider the environmental impacts of terrorist attacks before it licenses the new waste storage facility.

The NRC and industry claim that they have invested huge sums to increase security and put in place extra measures. It is not logical for the NRC to consider the threat of terrorist attacks extremely serious outside the NEPA context but only speculative and theoretical within it.

Bottom line -the ruling stated that agencies must conduct at least an environmental assessment for any government-approved project. If that review reveals the likelihood of a significant impact, the agency then must prepare a more thorough environmental impact statement. Re-licensing Pilgrim is a government-approved project; hence the SEIS logically should consider its impact - the draft did not. (PNPS-D-EE)

Comment: The second area of interest I would like to talk about is the section postulated accidents and I stated two factors that had to be factored in here, one was the decision of the 9th Circuit Court in California and also a proper reading of Section 5 of the GEIS. There is new and significant information regarding postulated accidents that was not considered. If considered, nobody could conclude that the result would be small... (PNPS-D-M)

Comment: Third, they regard the impact as small because they ignored the impact of spent fuel in postulated accidents and they ignored terrorism. There are two significant factors that require them, before they move forward in this decision, to look at terrorism and also to look at the impacts of spent fuel in a postulated accident, one is the 9th Circuit Court decision in California that was asked to address the question whether the NRC need consider terrorism on licensing decisions under NEPA, they answered yes. This process is a significant licensing situation so, therefore, this is a factor that has to be looked at. The Supreme Court was asked by the licensee in California to review the case and they refused to do so, meaning they concurred. (PNPS-D-Q)

Response: *The Ninth Circuit Court of Appeals in San Luis Obispo Mothers for Peace, v. NRC, 449 F.3d 1016 (Ninth Circuit 2006), upheld the Commission's decision on the Atomic Energy Act issues, but, as to the NEPA issues, concluded that "the NRC's determination that NEPA does not require a consideration of the environmental impact of terrorist attacks does not satisfy reasonableness review," and held that "the EA prepared in reliance on that determination is inadequate and fails to comply with NEPA's mandate." San Luis Obispo at 1035. The Supreme Court did not take review. Refusal to take review does not evince agreement with the decision below.*

In the recent Commission Memorandum and Order concerning the renewal of the operating license for the Oyster Creek Nuclear Generating Station ["Amergen Energy Company, LLC (License Renewal for Oyster Creek Nuclear Generating Station)," CLI-07-8, 65 NRC 124 (February 26, 2007), ADAMS Accession No. ML070570511], the Commission reaffirmed its long-standing position "that NEPA does not require inquiry into the consequences of a hypothetical terrorist attack. The Commission "respectfully .... disagrees" with the Ninth Circuit Court of Appeals decision, but and will follow the decision of the court as applicable to the Diablo Canyon matter. But, as to other proceedings, the Commission continues to believe that such inquiry is not required.

In the Memorandum and Order, the Commission also reached the following conclusions. First, terrorist issues are unrelated to "the detrimental effects of aging" and are beyond the scope of license renewal. Second, the environmental effect caused by terrorists is simply too far removed from the natural or expected consequences of agency action to require a study under NEPA. Third, a NEPA-driven review of the risks of terrorism would not be necessary because the NRC has undertaken extensive efforts to enhance security at nuclear facilities. These ongoing post-9/11 enhancements provide the best vehicle for protecting the public. Fourth, substantial practical difficulties impede meaningful NEPA-terrorism review, while the problem of protecting sensitive security information in the quintessentially public NEPA and adjudicatory process presents additional obstacles. Finally, the GEIS has already performed a discretionary analysis of terrorist acts in connection with license renewal and concluded that the damage and radiological release from such acts would be no worse than the damage and release to be expected from postulated accidents.

Aging Management

Comment: Known structural issues with the reactor, and it's component parts including the reactor, it's core, pipes, gauges, valves, control room and all other necessary buildings and parts necessary to the questionably safe operation of this experimental technology are wrongfully being removed from the re licensing review by claiming they are design flaws covered under the original application process. In fact and deed, the reactor now operating at the pilgrim facility is not the same reactor approval for original operation. The NRC's own internal documents on this, and every nuclear facility in America that are being kept from serious public scrutiny show an aging fleet of reactors that are requiring and ever increasing amount of maintenance and repairs to keep them limping along. Most disturbing of these repairs, is the use of patching of known cracks, fissures and out right structure breaks with the use of various welding techniques meant to keep the reactors operating at all costs. Problem with this, is two fold. First, much like a boiler, this welds numbering into the thousands, including ones in the core itself create new weak points along the outer perimeter of each and every seam. Even more disturbing, much of this weld repair is being done blind in the core of the reactor itself with unmanned welding machines, with no real way of verify the quality of the job, nor providing ways for visual inspect of these weakened inner core areas. Secondly, the patches, and the welds that create them are constantly mutating the noise technology parameters used to warn human operators of internal core dangers...in short, each patch, each weld adds new sets of false signals that have to be figured out and solved as the industry plays Russian Roulette with our lives, the NRC content to let us as a community pray that the next

guess, and the one after that, and the one after that is ALWAYS the right one. As George Bush has said about Homeland Security as relates to terrorism, we have to be right 100 percent of the time...running a reactor under that kind of a mind set and regulatory oversight scenario is begging for a cataclysmic nuclear incident here in America. Mathematical modeling lets us know, that humans will make errors, it is a foregone conclusion, and eliminating from review the physical aging and brittling of these antiquated relics of years gone by, asking communities to trust an industry and a regulatory agency with a record of putting profits ahead of safety and human health is unacceptable, and it is imperative that every license renewal include as a part and parcel of the process a full and complete safety and security assessment. These assessments are being asked for by our members of Congress on a case by case basis, and time again the requests fall on deaf ears...if in fact, as the industry is claiming, these facilities are structurally sound and safe, it would make sense that they would welcome even ask for these assessments themselves to assuage public fears. (PNPS-D-A)

Comment: Embattlement concerns of your aging reactor vessels. It is only a matter of time. (PNPS-D-PP)

Comment: And I believe that these issues are related to the aging process because they get worse as time goes on, the more that the plant operates, the worse they get. I mean one could make an argument that these issues are related to the routine operation of the plant, but a circuit board that's routinely operating over a period of 20 years and as it heats, and gets hotter, and more brittle and eventually will break, something that happens in the spent fuel pool as a result of 20 additional years of operation that could increase the probability of an accident needs to be addressed because then I call it an aging issue. (PNPS-D-V)

Response: *The NRC's environmental review focuses on environmental impacts relevant to the extended period of operation requested by the applicant. Safety matters related to aging are addressed as a part of the NRC safety review for the license renewal, which is conducted separately, and will be documented in an NRC staff Safety Evaluation Report. The safety review looks at the applicant's aging management programs for passive long-lived systems, structures and components. The Safety Evaluation Report for PNPS was published on June 28, 2007 and can be accessed in ADAMS at Accession No. ML071410438. The comments provide no new information and no changes have been made to the SEIS.*

Comment: Again the staff identified no new and significant information and concluded that there would be no socioeconomic impacts associated with decommissioning. Example: Leaks into Cape Cod Bay could significantly impact our air and water quality - not to mention socioeconomic impacts on our fishing and tourist industry and valuation of properties. (PNPS-D-EE)

Comment: "The potential for significant water quality impacts from erosion or spills is no greater when decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts."

The staff did not identify any new and significant information. If they had looked they would have concluded that there are no effective measures currently or in the aging management program to avoid impacts.

The staff ignored the points brought forward by Pilgrim Watch in their Motion to Intervene, May 2006. Contention 1 asserts that the Aging Management program proposed in the Pilgrim application for license renewal is inadequate because (1) it does not provide for adequate inspection of all systems and components that may contain radioactively contaminated water and (2) there is no adequate monitoring to determine if and when leakage from these areas occurs. Some of these systems include underground pipes and tanks which the current aging management and inspection programs do not effectively inspect and monitor. NRC staff need consider that:

We know that over the last decade a series of events, occurring at a quickening pace and with increasing magnitude, have raised serious questions about whether nuclear facilities are in compliance with federal regulations governing the release of radioactive materials into the environment - leaks have been reported at the majority of reactors. The industry is "addressing" the issue by a voluntary reporting program. Public safety requires requirements.

Exposure to radiation, including tritium, can cause cancer, disease, genetic mutations and birth defects.

Recent discoveries of leaked radioactive water in other nuclear facilities have made it clear that current methods for monitoring systems and components such as buried pipes and underground tanks are inadequate. In addition, the older the structure in question, the more likely it is for leakages to occur.

Pilgrim is specifically vulnerable to undetected leaks in its underground pipes and tanks because it has nonconforming pipe fittings and flanges. The United States Government Accounting Office reported that PNPS is suspected of having received counterfeit or substandard pipe fittings and flanges. This could make leaks of contaminated water more likely. There is no evidence in the applicant's filing that a thorough investigation at PNPS has occurred to determine precisely which pipe fittings and flanges are substandard and whether they have been upgraded to meet standards.

The Aging Management Program at Pilgrim does not provide adequate inspection of systems and components such as underground pipes and tanks. Appendix B describes the Aging Management Program for buried pipes and tanks. This section says that buried components will be inspected when excavated during maintenance, and that a focused inspection will be performed within ten years unless an opportunistic inspection occurs within this period - the focused inspection described is an untested Ultrasonic Test.

Pilgrim does not have monitoring test wells around, for example, buried pipes and tanks to detect leaks.

The topography of the Pilgrim site is such that, were a leak to develop in an underground pipe or tank, the contaminated water would most likely migrate seaward and drain into Cape Cod bay.

The only effective way to monitor for such an occurrence would be to have on-site monitoring wells located between Pilgrim and the ocean. A suitable array of wells, sampled regularly, could be used to test that the inspection program is working properly. (PNPS-D-EE)

Comment: Also, another example would be they are assuming that the regulation that doesn't require monitoring wells on-site unless the water is used for drinking is satisfactory. Clearly it is not satisfactory and it will not pick up leaks of contaminated water from buried pipes and tanks, for example, and the topography of the land is such that leaks, if they are there from either buried pipes or tank or from the waste that has been buried on site and denied, goes into the bay. (PNPS-D-Q)

Response: *The comments concerning aging management of buried piping at PNPS are addressed as part of the NRC's safety review for license renewal. During the safety review for license renewal, the NRC determines whether aging effects will be adequately managed. The Safety Evaluation Report for PNPS was published on June 28, 2007 and can be accessed in ADAMS at Accession No. ML071410438. Safety matters related to aging are outside the scope of the environmental review. The comments provide no new and significant information: therefore, no changes have been made to the SEIS in response to these comments.*

Need for Power

Comment: Page 1-8, Lines 10-11 - The number of homes serviced by electricity from PNPS is grossly understated. Rather than 13,000 homes, previous estimates by the electrical system transmission and distribution operator (NSTAR) identified the number to be about 550,000 homes. (PNPS-D-MM)

Response: *The comment is noted and Section 1.3 of the SEIS has been revised to reflect this comment.*

Comment: Blackouts aren't simply an inconvenience or a temporary loss of business, blackouts cause death because people who are already frail and infirm can't get heat or cooling they need to sustain life. High prices are a danger too as they cause folks to curtail electricity use and again result in real life safety concerns and possible harm. Over the past several months, there have been a few proposals for new power plants but most are small, still the largest proposal, Cape Wind, faces significant opposition and the smaller units have not even begun the very long siting process. As such, it becomes even more vital that we maintain our current supply, including Pilgrim. (PNPS-D-E, PNPS-D-P)

Comment: Mass AREA and its members are also comforted in the knowledge that Pilgrim's owners work diligently with state and local emergency officials, some of their programs include giving the local communities radio equipment so that they all operate on the same frequency and conducting extensive training sessions to make sure everyone is prepared in the event of

an emergency, be in plant-specific or a natural occurrence such as a hurricane or a blizzard. The real danger is a scenario that Massachusetts will face if the state does not have enough affordable and reliable electricity. (PNPS-D-E, PNPS-D-P)

Comment: Number six, there is no free lunch to fill our national and regional energy needs. I've been involved with these alternative energy things that came up and all through the last 30 years, massive federal funding of alternative energy, coal gasification, shale oil retorting, solar energy, wind power or fuel cells have not brought significant power to our electrical grid in over 30 years of technological effort.

Opposition to oil production off-shore and on federal lands with no added refining capacity since the mid '70s has left us dependent on insecure foreign sources, and I feel that as much as anybody, I was designing refineries back in the '70s and there were no more to design. Failure to extend Entergy's operating license leaves the town with problems, if not the responsibility of removal of a derelict plant and related transmission lines and equipment.

Questions regarding spent fuel, security and the impact of revenue lost from jobs and support revenue disappearing and disposition of the plant's acreage to new uses, condos.

Much of the foregoing is based upon my career-long experience with a multitude of technologically advanced industrial plants worldwide of the size, complexity and age at least as great as the Pilgrim station. (PNPS-D-L)

Comment: And when you take a look at the new economy here in the Commonwealth of Massachusetts, biotechnology, health care, computer technology, developers, all require vast amounts of energy to supply the laboratories and the life saving medical equipment, clean rooms and data centers. Obviously working families here in this Commonwealth need these industries in this new economy to thrive. Massachusetts has gone through a tremendous transition in the last ten years from a manufacturing-based economy to this sort of new age economy, if you will. (PNPS-D-N)

Comment: We need the energy produced at Pilgrim for our necessities and for those new technologies that become staples to our way of life. (PNPS-D-N)

Comment: We need nuclear power here in the Commonwealth, we need Pilgrim for three reasons pretty simple to me, as a representative of 400,000 working families in the commonwealth. The three reasons are jobs, jobs and jobs. We are talking about losing 700 good jobs here at the station, including 400 union workers, and I will say about the 400 union workers that they are highly trained, highly skilled, incredibly experienced professionals that are hard to replicate in this economy and we don't want to lose these good jobs.

These workers keep Pilgrim Nuclear Power Station safe, and productive and to not renew this license would be to displace them and that would jeopardize our energy supply, hurt our local economy and devastate their families. There is an obviously economic impact, $135 million in

annual economic activity. A very significant fact is that the Pilgrim plant purchases services from more than 75 Massachusetts companies, so you can see that the spread of that economic impact is dramatic here. (PNPS-D-N)

Comment: Now it was spoken earlier about the energy situation, especially here in the Northeast, and I can tell you that we are, we are very close to being in crisis here in the Northeast when it comes to power. With the growth in demand of electricity and the lack of generation, I think it would be not only a disservice to the workers and the community that would be hurt by this closing or non-renewal but it's a disservice as well to the energy grid and the fact that getting alternative energy sources like wind power. I mean if we are having trouble with wind power and new alternative sources, we cannot discard a source and a resource like Pilgrim Nuclear Power Station. (PNPS-D-O)

Comment: A number of businesses in Massachusetts, as we know and have enjoyed, have been engaged in research and development. We also have to think about the simple things, such as how do our supermarkets keep our food from spoiling as far as freezers are concerned, which run 24 hours a day, all of us enjoy going to the ATM, getting money out 24 hours a day, these things have to be run on electricity. We do have a number of hospitals that were in contact, they have inordinately high electric bills and most of them are operating, as we know, 24/7. (PNPS-D-V)

Comment: And I think we need to deal with the realization in fact of what are we going to do in 2012 when we have rolling brownouts, when we have them adversely effect hospitals, nursing homes, dialysis centers, and places where we buy our food and live our lives? We continue to slip because our costs for housing, health care and energy are not being replenished, we have to look at our situation realistically. Over 100 years ago, we all dammed up our rivers and that was a pretty big economic and environmental impact because we needed to create power to create jobs to run our mills, our manufacturing plants, and that's a problem that hasn't really hurt us either. (PNPS-D-V)

Comment: I own a company that manages approximately $250 million worth of real estate, my concerns, as far as the environment are concerned, is whether or not we are going to be able to replace the production, the electrical production, that comes if Plymouth is allowed to go off-line. (PNPS-D-V)

Comment: And my greatest concern is that we in the United States continue to slide in comparison to other countries. We are looking at and we know from the Wall Street Journal that the Chinese are building 80 nuclear power plants, the French are building 20. I would rather have my future depend on the United States Nuclear Regulatory Commission than thinking about the Republic of Korea or thinking about a third world country developing nuclear power. (PNPS-D-V)

Response: *The need for power is outside the scope of license renewal pursuant to 10 CFR 51.95(c)(2). The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs, as such needs*

may be determined by State, utility, and where authorized, Federal (other than NRC) decision makers. Since the need for energy is outside the scope of the environmental review, no changes have been made to the SEIS.

Energy Costs

Comment: The mining, refining, preparing fuel rods, transporting, set-up, monitoring, regulating, storing , etc. are, actually, prohibitingly expensive, and has been supported by government funds from the very beginning. Nuclear power is NOT cheap. (PNPS-D-AA)

Comment: From an economic standpoint, since the owners of the plant sell their power through long-term contracts and not on the volatile short-term market, the power produced at Pilgrim is much lower cost than the regional average. Massachusetts ranks fourth in the nation in terms of highest electricity costs, couple that with our high housing and health care costs and it becomes even more important to maintain Pilgrim's very reliable, low cost electricity so that we don't continue to have an exodus of residents and businesses from our state who can no longer afford to live or work here. (PNPS-D-E, PNPS-D-P)

Comment: We think it's essential to put our comments into the proper context. As an earlier speaker indicated, Massachusetts has very high electricity costs affecting every consumer, residential, commercial and industrial. Electricity has historically been driven, most recently, by the shift to generation by natural gas fuels which are costly and which have some concern about continued supply. Pilgrim Nuclear Power Station is a very important balance for these high costs and for the lack of fuel diversity in our state. (PNPS-D-F)

Comment: The plant produces a significant portion of our area power requirements that would otherwise need to be imported at far greater cost and environmental impact by fossil fuel-fired and generating plants burning scarce and costly natural gas or coal and oil with their negative environmental impacts or importing scarce and expensive Canadian hydro power. (PNPS-D-L)

Comment: We obviously need this power, it's reliable, it's safe, it's low cost. We need the Pilgrim Nuclear Power Station. We frequently hear in Massachusetts that we are losing population, we are losing jobs, especially young people, to other parts of the country where work is more plentiful and cost of living is lower. The consequences of loss of the people and loss of jobs means the rest of us need to pick up a higher proportion of those costs here in the commonwealth.

And one of the big costs, one of the big cost drivers in the Commonwealth for families obviously is higher energy cost and one way to stem the tide, if you will, is to keep Pilgrim open and in operation. Pilgrim provides some of the lowest cost and most reliable power available on our grid and another price contributor is the demand for electricity in Massachusetts is growing, but new supplies are not. If you are in some of our urban areas, there is a tremendous amount of growth taking place, some major buildings being constructed across this commonwealth. (PNPS-D-N)

Comment: One of my concerns is that Massachusetts is continuing to slip as an economic powerhouse, our young people are attracted to other areas. We do know that they are leaving because there are lower costs for housing, for health care and for energy costs. Businesses, such as mine and others, small and large, remain adversely affected by their monthly electric bills. As a number of you are aware, we had deregulation in Massachusetts approximately six years ago and our firm has, for example, already taken advantage of every energy efficient program and product available for properties that we manage such as dialysis centers, women's health centers, breast care facilities, sewerage treatment plants and other residential properties that we manage. (PNPS-D-V)

Comment: All of us on the South Shore have enjoyed our way of life and I think we have to look at that as actually a result of cheap energy. Deregulation happened for business in 2000. In 2006, I've looked at my energy bills, as a businessman, and I'm sorry to say that I've watched, as I pay my bill to National Grid, that my kilowatt per hour cost has gone from 6 to 7 cents per kilowatt hour, to 2006, it's gone as high as 12 cents per kilowatt hour and, looking at the month of January, it's gone from 12 cents per kilowatt hour to 13.82 cents per kilowatt hour, that's a 17 percent increase this month. (PNPS-D-V)

Comment: Now none of us probably should be alarmed, but what are we going to do when Pilgrim is off-line? As we have heard and as we know, we have had problems approving the wind energy program in the, off the coast and I look at Pilgrim as a plant that actually produces electricity at a lower kilowatt hour cost to us than a number of other alternatives. We cannot even approve a wind energy program when the Dutch have been using it for 800 years, we really have a problem and the problem is that we need to get beyond ourselves and we have to look at a situation where we have a reasonable cost of producing electricity and we have to be honest. (PNPS-D-V)

Response: *The comments are noted. The economic costs and benefits of renewing an operating license are specifically directed to be outside the scope of license renewal in 10 CFR 51.95(c)(2). Since the cost of energy is outside the scope of the environmental review, no changes have been made to the SEIS.*

Miscellaneous Out of Scope

Comment: How many accidents have been hidden from us as members of the stake holder community? For instance, I've heard rumors/reports here in the community surrounding Indian Point that a huge gaping hole was cut into the fuel pool at Indian Point 2, and that said gash leaked over 1,000 gallons of water into the ground on a daily basis for over a year while management argued with Under Water Welding on how to handle the problem...true...I am not sure, but I have reason to believe the source was/is legitimate enough to raise the issue. (PNPS-D-A)

Comment: The NRC, USEPA and other agencies of both state and federal government have wrongfully narrowed the scope of environmental issues with Indian Point, and have steadfastly refused to consider the cumulative effects of the known environmental problems on both human health, and the environment. Further, they have refused to do a qualitative on the cumulative

effects of dumping almost one trillion gallons of 100 degree irradiated waster waters back into the Hudson on a yearly basis, or too consider the cumulative effects nationwide of over 100 trillion gallons of heated water being dumped into our water ways. (PNPS-D-A)

Response: *On September 20, 2005, the NRC initiated a special inspection into leakage from the spent fuel pool area at the Indian Point 2 nuclear power plant. The leakage, discovered in early September, was minimal and does not pose any immediate health or safety concerns for members of the public or plant workers.*

The NRC Web page, http://www.nrc.gov/reactors/plant-specific-items/indian-point-issues.html, provides information to the public on the status of the leak and the NRC's response. This comment is outside the scope of the environmental review; therefore, no changes have been made to the SEIS.

Comment: Deliberate mis-statements/mis-representations by the NRC and other industry affiliations: The NRC has not learned the lessons of Three Mile Island accident - where NRC staff knew of leak rate problems for weeks prior to the accident - yet failed to shut down the reactor for repairs. The NRC continues with its obfuscations all over the country with similar, serious reactor plant problems (Davis-Besse, etc.). At Three Mile Island we are still waiting for former President Jimmy Carter to reveal what he has covered-up: The President's Report a/k/a the Kemeny Commission Report, .."suppressed the most alarming aspects of that report." ...the report, if published in its entirety, would have destroyed the civilian nuclear power industry..." See Attachment 1 and 8. Based on this statement alone - you, the NRC, should not relicense Pilgrim. We, the people, do not trust the NRC to protect U.S. You lie and believe your own lies. You are destroying the industry because of profits before people. At Three Mile Island country we have the highest thyroid cancer rate in the country and the only cause is the Three Mile Island fallout of 1979. We received Bomb Test Fallout Equivalent doses at TMI and the U.S. Government-Ivory Purpose Knows It! (PNPS-D-PP)

Comment: What about Three Mile Island ? It took eleven years to clean up the site and the reactor building is still intensely radioactive. (PNPS-D-AA)

Response: *Three Mile Island, Unit 2 (TMI-2) operating license was issued on February 8, 1978, and commercial operation was declared on December 30, 1978. On March 28, 1979, the unit experienced an accident which resulted in severe damage to the reactor core. TMI-2 has been in a non-operating status since that time. The licensee has conducted a substantial program to defuel the reactor vessel and decontaminate the facility. All spent fuel has been removed except for some debris in the nuclear steam supply system. The plant defueling was completed in April 1990. TMI-2 has been defueled and decontaminated to the extent the plant is in a safe, inherently stable condition suitable for long-term management. This long-term management condition is termed post-defueling monitored storage, which was approved in 1993. This comment provides no new information, and therefore, no changes have been made to the SEIS.*

Comment: Everyone knows about Chernobyl ..."it" happened almost 20 years ago. The cement used to cover over the meltdown hole is settling, cracking, disintegrating. Millions of people "downwind" throughout Europe have suffered all kinds of medical problems since then. What does the future hold? (PNPS-D-AA)

Response: *With respect to a Chernobyl-type accident at a U.S. nuclear power plant, U.S. reactors have different plant designs, larger shutdown margins, robust containment structures, and operational controls to protect them against the combination of errors that led to the accident at Chernobyl. Although the NRC has always acknowledged the possibility of major accidents, its regulatory requirements provide adequate protection, subject to continuing vigilance, including review of new information that may suggest weaknesses. Assessments in light of Chernobyl have indicated that the causes of the accident have been adequately dealt with in the design of U.S. commercial reactors. The comment does not provide any new or significant information. Therefore, no changes have been made to the SEIS.*

A.3 Public Meeting Transcript Excerpts

Transcripts of the Afternoon Public Meeting on January 24, 2007, in Plymouth, Massachusetts

[Introduction by Mr. Cameron]
[Presentation by Ms. Williamson]
[Presentation by Ms. Hurley]

MS. CINGOLANI: Good afternoon. I'm just a local yokel and I don't have much to say except that I feel, in the long run, fission-based power is not the answer and I personally do not want to see nuclear power plants' lives extended any more than they have to be. The fusion power plants, such as is being built in Europe, probably is a better answer in the long run, but it's going to cost billions of dollars. Meanwhile, over in China, there is a country that's already on the New York Stock Exchange and they are getting into cheaply making silicon-type -- I don't have my notes with me -- voltaic cells and so forth. And if China really gets into this, they'll be making all the materials they need, all the electricity they can get, they've got over a billion people over there.

Meanwhile, in California, there is many, many companies, one that comes to my mind is Pyron, which is connected with Boeing Spectrolab, and they have made and designed an array of glass, magnifying glass, small cubic-type things, I can't explain it, and a 25-foot diameter array which focuses the sun's energy onto voltaic-type generators. And it seems to me that, in the long run, the world has to turn to materials and processes that do not involve radioactive materials which are dangerous, no matter what you say about how they decompose and blah, blah, blah. This stuff has to be stored, it has to be transported.

Anyone here already knows enough, much more than I do, and can argue every point I'm trying to make. But I feel it's common sense to start the process to truly clean and probably in the long run will be cheaper-type energy. The solar array that I just mentioned is 40 percent efficient and already solar energy is down to about $2 a kilowatt, if my, I'm not sure if I'm right

on that, but it's been cut in half, it was $4, now it's down to $2 and it's heading for a cheaper and cheaper base level.

And I don't have anything more to say, this is all my personal opinion, and I'm not an expert, but I have lived across the bay from Pilgrim since it was built, and I fished outside of it and I even drove down there one time, drove right in, I probably can't do it now, walked all around and nobody stopped me, but this was roughly 20 years ago, and I took pictures and I also have a whole album of pictures I took inside Pilgrim of all their machinery and everything as a project for a class I was taking at Bridgewater State College. So I've always been interested in Pilgrim, but common sense tells me it's time to start phasing out of this type of electrical source.

MR. CAMERON: Thank you very much, Lilias, we appreciate those comments on alternative energy sources.

And let's go to Mary Lampert now from Pilgrim Watch.

MS. LAMPERT: Good afternoon.

My students in the dark ages always referred to me as a very tough grader and I think the NRC will feel the same. I clearly think you are going to be very, very busy until July because the conclusion that the impacts are small, excepting for two species of fish, I feel result from two parts, one, by ignoring and misinterpreting new and significant information; second, by assuming the rules that were largely put in place in the 1970s currently and in the future are protected of public health and safety, are being followed to the T by the licensee and the NRC is assuring that it is. Anybody who heard of the Davis Bessey plant with a whole in its head, I think I don't have to say anymore.

Before I start my comments, I think there are two points that have to be brought up, in the GEIS Section 5 it deals with design-basis and severe accidents with an emphasis on releases substantially in excess of permissible limits for normal operations. Nowhere in this section is the spent fuel pool excluded nor the reactor core cited as the only risk. Therefore, I will argue that you are remiss not to include in the supplement the spent fuel pool under postulated accidents.

Second, another issue near and dear to citizen's hearts is security and terrorism. The 9th Circuit Court in California faced the question of whether the NRC needs to consider terrorism in licensing decisions under NEPA, they concluded that in fact they did. This is an important licensing decision. The industry in California went to appeal to the Supreme Court and the Supreme Court decided not to hear it which indicates they gave their blessing to the decision. So these to factors, therefore, that being terrorism, security and the spent fuel pool under postulated accidents must be considered if you are going to do an honest job.

And now I'll try to focus my comments on the areas of major concern to citizens which are health, postulated accidents, spent fuel, radioactive waste. The NRC draft concluded that there was nothing new or significant and the impacts from radiation on health would be small, they did this by misinterpreting and ignoring important significant information that pertains

specifically here. Very basically, they ignored new and significant research that shows radiation's effects are cumulative and they effect the most vulnerable, the old, the young and the sick. By ignoring this, then they went on to ignore and give significance to important facts here.

Demographics. By 2032, during the licensing period, the population is expected, one in three, to be over 55, it's one in five now, therefore a more vulnerable population will be in this area. Second, they ignored the radiation-linked diseases that are in this area. The former founder and director of the Mass Cancer Registry has done an analysis, year to year, of cancer statistics in the seven communities that are likely to be impacted which was determined from a state study on health impact. They have seen, every single year, either statistically significant or elevated rates of leukemia, rates of thyroid cancer until this very day, this was ignored. Also ignored was the fact of elevations in prostate and multiple myeloma from 1999 to `02. Therefore, again, a population that is sensitive.

They also ignored looking further at the Southeastern Massachusetts Health Study. They didn't ignore it, they simply misrepresented it, which is quite shameful, I might add. The Southeastern Massachusetts Health Study stated, was a study done by the Mass Department of Public Health on adult leukemia and found a, concluded a fourfold increase the closer you lived or if you worked at the reactor. Then there was a re-review, a second peer review panel, politically appointed so that Boston Edison, the then owner, could appoint half the panel and approve the half.

However, the draft says that the NRC considered the relevant information in the re-review -- they didn't use that word -- and concludes that the peer reviews and even the authors now agree that the study does not demonstrate a causal relationship between Pilgrim effluents and the potential effect of cancers in the areas around the state. So, I called the principle author of the study and I said did you talk to them? He said no, I never talked to them, I stand by this study, as did Boston Edison's own peer review panel, hand-picked, that said the results can not be discarded because of methodological weaknesses.

And I said, well, what about the Assistant Commissioner, Suzanne Condon? What did she say? And I have e-mails to this effect, oh, she said the department stands by these studies, this particular study, and they went on further, the association between leukemia and the proximity to Pilgrim was unexpectedly strong and this raised biological plausibility of the study, the study results could not be dismissed. Then the NRC goes on in the draft to cite various studies that supposedly say there is no association between exposure and living and being near a reactor.

What they did was cherry-pick studies that were the industry's and government's equivalent of the tobacco scientists. What they failed to do is to look at all the recent research that is out there, and I would refer you, and I will in writing, to Clark University's Marsh Institute that has collected all research that is done on this area. Then they go to the BEIR 7 report and say there is nothing really new or significant there to change our determination. The reality is that what they didn't say is what the BEIR 7 report had to say on the incidents of cancer being a third higher than they previously thought.

What they didn't say was the BEIR 7, speaking specifically to the greater effect of low dose radiation exposure on women and children, over 30 percent higher in woman. What they didn't say is the new information on effect on workers, if they receive the maximum allowable dose, where NRC had said one out of eight would get cancer, now BEIR 7, one out of four. All these things are clearly significant. What they didn't say in the draft was the BEIR 7 talked about health effects other than cancer that can be expected from low dose radiation exposure such as heart disease and stroke.

And what they didn't say when they were talking about health effects in the postulated accidents section of the new and significant information presented by the Massachusetts Attorney General of the likely health consequences of a spent fuel pool accident at Pilgrim, yes, 24,000 cancers expected if there is a complete release of just Cesium 137, 8,000 if only ten percent of that bad guy is released.

What they didn't say under postulated accidents was a reference to the Sandia National Report, the CRAC II which in 1982 NRC asked them to do for the consequences specifically of a core melt at each reactor and what that study said was that you could expect 3,000 early injuries -- no, what was it? No, 3,000 fatalities and 30,000 early injuries, that was `82.

But what they didn't look at was Dr. Edwin Lymon, a Union of Concerned Scientists report done on why these figures have to be updated, why they are conservative, new information of why this is pertinent now. And so by ignoring or misinterpreting these important factors, they fail then to look at significant mitigation that could occur and they ignore the fact that, guess what? I don't know how much radiation is coming out of there, Entergy doesn't know and the NRC doesn't know, and so an important mitigation step going forward, if you are honest about health effects, is to have a requirement or look at to analyze.

I mean that's what you are supposed to be doing, having combination real-time wind and radiation detectors placed in logical areas in off-site communities that provide real-time data on this to the state, and to the local communities and to the NRC. Hey, they should know too. This was recommended back in 1990, we are talking about the future until 2032, so you can play your games and not analyze the real, the new and significant information that is out there, take your cherry-picked, tobacco science equivalent studies and continue pretending, and also looking at acceptable dose to a mythical, mythical 30 year old healthy guy and not the effect that it should be on those who are most sensitive, which BEIR 7 points out are the young, the old and the sick. I think that's what I have to say about health.

Now, do I have time for my other subjects?

MR. CAMERON: Mary, let's go on to other people, if that's--

MS. LAMPERT: Okay.

MR. CAMERON: --fifteen and--

MS. LAMPERT: Because I would like to talk about waste and postulated accidents but, thank you, I appreciate the position you are in and you are always very courteous and fair to people.

MR. CAMERON: Thank you, Mary, we'll see if we can get back to you.

There is other issues and would you make sure --. You mentioned the Massachusetts Cancer Registry and just make sure that the staff has access to a Web site or how to get that information. I don't know, they may already know about it, but I just want to make sure that they have that in your written comments. And I don't want to get into a discussion of BEIR 7 but I noted when Bobbie mentioned it and you mentioned it now that it's not going to be evident to people, all people, what exactly BEIR 7 is. And I just want to ask Bobbie to just tell us not about the study but what does BEIR stand for and who is that? Oh, Alicia? Okay, beautiful.

MS. WILLIAMSON: Basically, BEIR stands for Biological Effects of Ionizing Radiation, it's a study that's conducted by the National Academy of Sciences. It's published, if I'm not mistaken, about every three years. Is that correct, Rich? He is our senior health physicist, he is the expert on that, but that's correct, Rich? About every three years they publish that?

I might turn it over.

MR. CAMERON: And, Rich, without, if you could just tell us why this is BEIR 7? In other words, just who is doing this and why are they doing it, I guess, so people understand.

MR. EMCH: It's called BEIR 7 because there have been seven reports, the first one was BEIR 1 back in, I don't even remember the exact date, probably somewhere around 1972. The BEIR reports that talk about ionizing radiation, which is what we are talking about here, the entire title of this BEIR 7 report is "Health Risks from Exposure to Low Levels of Ionizing Radiation, BEIR 7, Phase II", and each of the, the 1, the 3, the 5 and the 7 all talked about similar issues and they've been published at various intervals, probably not three years, since the first one was in the mid `70s. They have been published at very intervals over the years and the draft of this one came out in 2005 and the final version came out in 2006.

MR. CAMERON: Okay, thank you very much.

And as we heard, the draft supplemental environmental impact statement looks at BEIR 7, and you have heard Mary Lampert talk about the study and when Mary and others submit their comments, written comments that will be available to people, they'll be discussing BEIR 7 too, so just so you know what that acronym is. And let's go to Joyce, this is Joyce McMahon and she is from Mass AREA, and then we are going to go to Bob Ruddock, Rebecca Chin and John Stobierski.

MS. MCMAHON: Good afternoon. My name is Joyce McMahon and I am the Communications Director for the Massachusetts Affordable Reliable Electric Alliance, Mass AREA for short.

First, let me thank you for taking this opportunity to address the commission, we do appreciate your time. Second, I would like to tell you a little bit about Mass AREA and why we felt it was important to be here. Mass AREA is a diverse, state-wide group comprised of more than 65 labor, trade associations, businesses and, with fill disclosure, including Entergy, educators, scientists, advocates and community leaders.

During today's sessions, you'll hear from some other Mass AREA members, including the South Shore Chamber of Commerce, the Massachusetts AFL-CIO and the Associated Industries of Massachusetts. As a group, we are committed to finding clean, low cost and reliable electricity solutions that benefit all of Massachusetts, it is an urgent public policy challenge. We came together one year ago after several warnings were issued by the Federal Energy Regulatory Commission, ISO New England and others that energy supplies will be insufficient to meet peak demand as early as 2008 and that energy prices are causing hardship for the region's businesses and residents, especially the most vulnerable populations such as the elderly and low income.

While Mass AREA's mission is brought in focus to include new electric generation in the form of renewable energy resources, improving the transmission infrastructure, developing new natural gas supplies and encouraging energy efficiency, Mass AREA and its members fully support a license extension for the Pilgrim Nuclear Power Plant. On a typical day, Pilgrim provides seven to nine percent of the Commonwealth's electricity. Without it, Massachusetts and the region as a whole could face power supply shortages, including rolling blackouts, a lot sooner than predicted of next year.

Perhaps one of the most important issues that led Mass AREA to support a license extension for Pilgrim is the fact that the plant operates safely and continuously earns the NRC's highest safety rating of green. We also know that NRC staffers are on-site at the plant each and every day overseeing operations and helping to maintain a safe and secure environment.

The production and distribution of electricity, whatever the source, is inherently a challenging safety issues, yet nuclear power has proven safe. In 50 years of commercial operations, there has never been a radiological death at any U.S. nuclear plant.

Mass AREA and its members are also comforted in the knowledge that Pilgrim's owners work diligently with state and local emergency officials, some of their programs include giving the local communities radio equipment so that they all operate on the same frequency and conducting extensive training sessions to make sure everyone is prepared in the event of an emergency, be in plant-specific or a natural occurrence such as a hurricane or a blizzard. The real danger is a scenario that Massachusetts will face if the state does not have enough affordable and reliable electricity.

Blackouts aren't simply an inconvenience or a temporary loss of business, blackouts cause death because people who are already frail and infirm can't get heat or cooling they need to sustain life. High prices are a danger too as they cause folks to curtail electricity use and again result in real life safety concerns and possible harm. Over the past several months, there have

been a few proposals for new power plants but most are small, still the largest proposal, Cape Wind, faces significant opposition and the smaller units have not even begun the very long siting process. As such, it becomes even more vital that we maintain our current supply, including Pilgrim.

Opponents of the Pilgrim Power Plant often say we will be better off if the generator was decommissioned. However, the baseload power that would replace Pilgrim would most likely come from sources that are more expensive, far more polluting or both. At this time, wind and other renewable energy technologies simply can not generate the massive baseload power that would be needed were Pilgrim to cease operations. Moreover, the electricity that Pilgrim supplies is created without generating any greenhouse gas emissions and therefore it does not contribute to global warming.
Pilgrim also mitigates the production of hundreds of tons of sulfur dioxide and nitrogen oxides, chemicals which are harmful to human health, especially among children and the elderly, these health and environmental benefits alone are enough argument for renewing Pilgrim's license to produce power.

From an economic standpoint, since the owners of the plant sell their power through long-term contracts and not on the volatile short-term market, the power produced at Pilgrim is much lower cost than the regional average. Massachusetts ranks fourth in the nation in terms of highest electricity costs, couple that with our high housing and health care costs and it becomes even more important to maintain Pilgrim's very reliable, low cost electricity so that we don't continue to have an exodus of residents and businesses from our state who can no longer afford to live or work here.

Speaking of work, Pilgrim is also an important source of jobs, it has more than 700 permanent full-time employees, most of whom live in Plymouth and the surrounding communities, indeed Pilgrim supports the local economy to the tune of $135 million in local economic activity. Though the draft environmental impact statement noted a moderate socio economic impact should the plant cease operations, we believe those who would lose their jobs would face a large economic and financial loss.

In summary, Mass AREA has weighed all of the environmental, economic and energy supply traits of Pilgrim, particularly its long record of safety, and concluded that the Pilgrim Nuclear Power Plant is vital to the region, state and local economy for three reasons, its environmentally sound operations, its economic contribution to the local community through the provision of jobs and purchase of goods and services and its provision of reliable, low cost electricity. Mass AREA encourages the NRC to grant Entergy's Pilgrim station an extension of its license so that it can continue to safely operate for an additional 20 years.

Further, we urge the Atomic Safety and Licensing Board to consider the Pilgrim related matters before it as quickly and expediently as possible while the license renewal process takes its natural pace. Again, thank you for the opportunity to speak with you today.

MR. CAMERON: Thank you, Joyce.

Next we have Bob Ruddock. And while he is, just let me note that Alicia pointed out that there is a commission paper, which is a staff report to the Nuclear Regulatory Commission, back on the tables that address this BEIR 7 issue in more detail, for anybody who wants some more information on it.

MR. RUDDOCK: Good afternoon. My name is Robert Ruddock and I am the General Counsel for Associated Industries of Massachusetts. On behalf of AIM, I want to thank the Nuclear Regulatory Commission for the opportunity to present our views here this afternoon, for conducting this meeting and for the opportunity to provide these comments.

AIM is a statewide association of employers, more than 7,000 of them are our members, they employ roughly 680,000 employees across the commonwealth. The organization's goal is to effect public policy to create a positive economic climate for our businesses and for jobs in the State of Massachusetts.

We think it's essential to put our comments into the proper context. As an earlier speaker indicated, Massachusetts has very high electricity costs affecting every consumer, residential, commercial and industrial. Electricity has historically been driven, most recently, by the shift to generation by natural gas fuels which are costly and which have some concern about continued supply. Pilgrim Nuclear Power Station is a very important balance for these high costs and for the lack of fuel diversity in our state.

In addition, the critical role Pilgrim plays in supply and diversity, its role in producing electricity without air pollutants and laudatory, no pollution contributes to the state's goal of reducing greenhouse gas emissions. Achieving these goals will have some cost impacts on all consumers, but it's great to know that Pilgrim station provides economical electricity without a carbon footprint. Pilgrim also contributes to meeting and sustaining the electricity supply, as our demand grows on average of about two percent a year compounded.

With that as context, AIM believes that the draft environmental impact statement adequately complies with the requirements of the act, AIM urges the commission to adopt the recommendation of the report to continue consideration of relicensing. Given Pilgrim's positive contributions to the reliability, supply and cost of electricity in this state and its significant environmental benefit, we also would urge the commission to in fact relicense this plant.

Thank you again for your attention.

MR. CAMERON: Thank you very much, Bob.

Next we are going to go to Rebecca. Rebecca Chin is with the Duxbury Nuclear Advisory Committee.

MS. CHIN: Thank you. I'm also a former Chairman of the Duxbury Board of Health, so I would like to keep that in context with my first set of comments.

The NRC DSEIS concludes that the health impact is and will continue to be small by mischaracterizing the Southeastern Massachusetts Health Study. The DSEIS states that the authors of the Southeastern Massachusetts Health Study have stated that the study shows both a statistical association and a cause and effect relationship between leukemia incidents around the nuclear power plant and exposure to effluents from the plant.

The final report released to the public in October of 1990 found a two to fourfold increase of leukemia among residents of certain towns within a 20 mile radius of the plant, the draft goes on to cite peer reviews from a second rereview peer group that did not support the causal relationship. However, the peer review panel referred to in the draft was appointed by Boston Edison's request, the owner of Pilgrim at the time, and contrary to accepted scientific practice, half of the rereview panel members were appointed by MDPD and the other half by Boston Edison, the company directly impacted and implicated by the study's findings.

In the executive summary of its report though, the second peer review panel concluded that the findings can not be readily dismissed on a basis of methodological errors or proven biases, the association found between leukemia and the proximity to the Pilgrim nuclear facility was unexpectedly strong and this raised concern regarding the biological plausibility of the study. However, because the study's results could not be dismissed, further study may be warranted, including expanding the case finding and including children.

The study noted that Boston Edison admitted higher than average releases in the early days due to poor fuel or damage rods and lack of filtration systems, the study researchers also knew that a number of possible points were not monitored and the monitors on even the main stack did not measure all types of radiation, that significant radiation had been reported in shellfish, milk and vegetation near the plant. The re-review panel member schooled in monitoring was a Boston Edison employee who discounted any unmonitored releases and blamed the too high radiation levels in milk and vegetation on bomb testing in China.

The panel also claimed that if Pilgrim had released significant levels of radiation, it would have been detectable on large numbers of monitors throughout Eastern Massachusetts. However, the Boston Edison appointee was questioned on this and he conceded that, in 1970, there existed only three monitors, one at Pilgrim, another at MIT Cambridge keeping track of MIT's reactor and a third in South Boston keeping tabs on Dupont. These had the same lack of sensitivity as Pilgrim's and were too far away to realistically have been expected to detect Pilgrim's emissions.

The inescapable conclusion is that, both in the 1970s and now, no one really knows how much radiation Pilgrim emitted. The re-review panel effectively admitted as much, suggesting that there should be an independent evaluation of the potential radiation exposure from the Pilgrim plant and from other sources. The study was even more explicit, it recommended that a system of real-time monitoring and radio nucleotide emissions be implemented so that reliable and

timely data are available by which exposure can be assessed more precisely.
The re-review panel's statement in the study's conclusion is contradicted by the fact that the death rates for the study have remained close to the state average exemplifies the how to lie with statistics problem. The re-review panel looked at death rates for Plymouth County as a whole, the Southeastern Mass study found an increased risk in those, to those in a much smaller, more concentrated area likely, within the likely to be impacted geographic area. The re-review panel's executive summary admitted that there have been other reports of observed cancer increases that are inconsistent with predictions based on mathematical modeling and radio biology theory.

In 1990, the Southeastern Mass findings was not based on mathematical models or estimates of radiation releases, rather it was focused on what really happened to real people. The NRC's impact statement ignores the principle Mass Department of Public Health and peer review conclusions that the findings can not be dismissed and that further attention to the possible risks associated with the power plant may be warranted, including expanding case findings and including children.

My second comment is on the DSEIS, that the NRC staff mistakenly concluded that the applicant's SAMA analysis was sound, that the faulty SAMA analysis used by Entergy in the environmental report caused it to wrongly dismiss mitigation alternatives such as adding a filter to the direct torus vent. The purpose of a SAMA review is to ensure that any plant changes that have a potential for significantly improving severe accident safety performance are identified and addressed, one examples of how a poorly performed SAMA analysis can lead to erroneous conclusions is the Pilgrim environmental reports look at the cost and benefits of installing a direct torus vent filter at Pilgrim.

The direct torus vent system is a method to relieve high pressure which is generated during an accident review, severe accident, excuse me. In 1986 it was determined that the Mark I containment, especially being smaller with lower design pressure, in spite of a suppression pool, has a 90 percent probability of that containment failing. The purpose of the containment is to provide a barrier between the lethal radiation inside the reactor and the public. In order to protect the Mark I containment from total rupture, it was determined necessary to vent high pressure build-up. As a result, the direct torus vent system to all Mark I reactors, including Pilgrim, was installed.

Operated from the control room, the vent is a reinforced pipe installed in the torus and designed to release radioactive high pressure steam generated in a severe accident by allowing the unfiltered releases directly to the atmosphere through a 300-foot vent stack. Use of the vent discharges steam and radioactive material directly into the atmosphere, bypassing the standby gas treatment system filters normally used to process releases via the containment ventilation pathway. There is no radiation monitor on the pipe and valves that compromise the direct torus vent line and operators now have the option to direct action to expose the public and the environment to unknown amounts of harmful radiation.

As a result of Pilgrim's design deficiency, the original idea for a passive containment system has been dangerously compromised and given over to human control with all its associated risks of error and technical failure. There appears to be an internal contradiction in what we are being told, the NRC believes that the release from a severe core melt accident would be reduced by a factor of 100, this is considerably more optimistic than estimated in the NRC's first study on the subject.

As the contention is that the reduction of a filtration system would have zero benefit, here the contenders seem to be assuming that a factor of 100 equals 100 percent and that's false, even a release of 1 percent of the core's radioactive iodine and cesium would be a very severe event.

In its environmental report, Entergy analyzes the benefits of installing a filter to the torus vent in the course of reviewing possible severe accident mitigation alternatives, their report states this analysis case was used to evaluate the change in plant risk from installing a filtered containment vent to provide fission product scrubbing. A bounding analysis was performed by reducing the successful torus venting accident progression source terms by a factor of two to reflect the additional filtered capacity and capability.

Reducing the releases from the vent path resulted in no benefit, according to the state report, the basis for conclusion that successful torus venting accident progression source terms are reduced by a factor of two to reflect the additional filtered capability, the cost of implementing SAMA at Peach Bottom was estimated at $3 million. Therefore, this SAMA is not cost effective for Pilgrim. Entergy has determined that, in return for a cost of $3 million, there will be no benefit to public health or safety.

How is it possible to find zero benefit from installing a filter that would reduce by a factor of two the radioactive venting to the public in a case of a severe accident? Unfiltered venting has been judged unsafe by all regulatory agencies outside the United States. In its analysis of several risk contributors to core damage frequency, the disposition of those events frequently included venting via the direct torus vent path to reduce containment pressure. In other words, a filter in the torus vent would reduce the impact in many possible severe accidents.

The only conclusion to draw from the outcome of the direct torus vent filter SAMA analysis is that Entergy has used the MACCS II code to downplay the health and economic cost of severe accidents and use the probablistic safety analysis model to make the benefits of mitigation appear to be zero. NRC staff reviewed Entergy's analysis and concluded that the methods used to implementation of those methods of sound, the costs of SAMA's evaluation would be higher than the associated benefits in 2.2, in 5.2.5. The NRC staff is wrong to accept Entergy's SAMA analysis in this application.

The SAMA analysis included in the Pilgrim environmental report is incomplete, not only does the probablistic modeling for severe accidents artificially make consequences appear insignificant but the application has used incomplete and incorrect input parameters to the MACCS II code. The direct or torus vent filter is an example of how this cost/benefit equation might have been skewed in favor of no mitigation. While the NEPA does not require agencies

to select particular options, it is intended to foster both informed decision making and inform public participation and thus to ensure the agency does not act upon incomplete information only to regret its decision later, after it's too late to correct. It then said if further analysis is called for, that in itself is valid and meaningful remedy under NEPA.
The applicant has drastically undercounted the cost of severe accident and this could have led it to erroneously reject mitigation alternatives, further analysis is called for. The EPA has acceptable standards for exposure, in the real world there is no safe level of exposure to radiation.

In conclusion, the danger of NRC rubber stamping the Entergy's SAMA in the DSEIS, accepting the licensee's minimization of consequences that make the cost of adding a filter to the direct torus vent seem unnecessarily high or not cost effective when it is obvious that the mitigation of installing the filter could indeed serve to protect the public health and safety, I repeat unfiltered venting has been judged unsafe by all regulatory agencies outside of the United States.

MR. CAMERON: Thank you. Thank you very much, Becky.

And we are going to go now to John Stobierski.

MR. STOBIERSKI: Good afternoon. I would like to thank you, Mr. Cameron, Ms. Williamson and Ms. Hurley for your presentations and for running a very good, and informative and fast paced meeting, I appreciate it. And I appreciate the presence and the diligence of your colleagues as well who are working on the relicensing of the Pilgrim Nuclear Power Plant. I will try to be brief and not try your patience.

My name is John Stobierski, I am here representing the South Shore Chamber of Commerce, which is an independent association of 2,000 businesses, including health care and educational institutions and nonprofit organizations in the communities from Boston to Plymouth, we are the largest chamber of commerce in Massachusetts. We are an association of business people who are committed to the economic health and the quality of life of the communities that we serve.

A few months ago, we invited members of our leadership to examine the issues surrounding the relicensing of Pilgrim Nuclear Power Plant and whether it was an issue that the chamber should get involved with, whether we should weigh in. We reviewed the record of the Pilgrim Nuclear Power Plant and its 34 years of operation safely as a neighbor of ours, we examined its contribution to the economy of this region, the 500 people that it employees directly, the 130 contract employees who serve at the plant and the economic offshoots of that employment base and of the businesses that do business in this region because of the presence of the plant.

And they evaluated the plant in terms of our need as a region, as a growing region, one of the few growing areas in the Northeast, the need for diverse and reliable and affordable sources of energy. The residents and the employers who are here, who may be moving here as this area grows, are deciding whether to make a long-term investment in our region and the status of the

Pilgrim station is very important to those decisions. Recently, a dozen and a half of our board members and other leaders of the chamber spent some time at the plant, these are folks from construction and engineering and manufacturing and environmental sciences.
And I'm not going to represent to you that they conducted a thorough, top to bottom survey of every last square inch of the plant, but this was not some awed troop of Brownie Scouts either, these were skeptical business people who have an investment in this region and want to make sure that nothing they do or say jeopardizes the safety or the reputation of their employees, their neighbors in the area where they are invested. After evaluating the plant and its contributions to our region, its economic impact, the employment base, its environmental record, the addition, the very critical addition that it makes to a diverse and reliable energy supply and the plant's presence and overall contributions to the quality of life in our region, our leadership voted, after a healthy discussion, voted and voted unanimously to encourage the Nuclear Regulatory Commission to approve in a timely fashion the full relicensing of the nuclear power plant.

We are pleased to have this safe, secure, reliable source of power and its significant beneficial contributor to the employment base and to the overall economic well being as part of our region and we thank you very much.

MR. CAMERON: Thank you very much, John, for those comments.

We are going to go to Malcolm, Mr. McNaught. Is Malcolm McNaught still here?

Okay, Pine duBois? And Pine is from the Jones River Watershed Association. And then we'll go to Ben Morgan and then to Heidi Mayo from Pilgrim Watch.

MS. DUBOIS: Thank you, hi. I am from the Jones River Watershed Association, which the Jones River is just a few miles north of here and drains as the largest river into Cape Cod Bay, and I'm here to just preview, I guess, my comment that I hope to make in writing prior to the deadline with some others who are concerned about the aquatic and marine habitat. And although I share concerns of many of the other residents regarding the safety and what we were just previously talking about, I'm not going to address those now.

As far as the impact analysis, we do continue to be extremely concerned about the fisheries that inhabit Cape Cod Bay and in particularly the estuary of the Jones River which are in sever decline. We have concerns about the methods and approach and the limitations of the approach in the document, although I do admit that I found the document extremely interesting and informative reading. However, because the populations of herring, Alewife, Rainbow Smelt, Shad, American Eel are all in severe decline in the Jones River and elsewhere on the Atlantic Coast region, I believe that even the assessment of moderate impact is inaccurate, and that continued impingement and entrainment of these types of species on the Pilgrim intake screens is severe. And that even though I understand from the document that the NPDES permit will consider modifications to that intake, it's my opinion, and we will comment this way, that there should be no relicensing certainly without considerable modification to the intake and discharge structure that provides cooling water to the plant.

I think this is an extremely significant and difficult proposition, I believe it deserves attention that should have been given to it a long time ago. I believe that the monitoring that has been done since 1972 certainly has made that clear and I'm sorry that the industry has waited until the NPDES renewal to begin to address it.

In addition, I think that there needs to be some consideration given to the facts of global warming, I was interested to read in the report that Pilgrim made an attempt to deepen the intake channel because they wanted to get the water cooler and that effort failed.

I think, in general, the ocean is getting a little warmer, certainly the bay is getting warmer, and I believe that it is in part getting warmer not only because of global influences but because there is a continual daily thermal discharge of superheated water from the plant as a result of the cooling function. And that the documents do not consider the impact of that general warming upon the bay, upon the essential fish habitat and upon the species that live there, and I think this was a flaw in the supplement and I believe that it should be corrected in the final, that the warming of the bay waters has to be considered.

What was considered was the shock to the species, in terms of the discharge and I believe that the report basically says, well, a fish can swim away from superheated water, and while I believe that's true, I think if the general warming pattern is there, then we are kind of --. Like us in this room, we are sort of all stuck with the environment that we happen to be in at the moment and if you can't get out of it, you have to suffer the result. That is what's happening to our marine fisheries, and there is a bigger impact than locally to Pilgrim or locally to the Jones River, and we have to pay attention to that and we cannot delay that attention any longer, anymore than we can delay the attention given to some of the other concerns.

Cape Cod Bay is an ocean sanctuary under Massachusetts state law, that wasn't mentioned in the report. It is a violation of state law that anything effect a habitat and I think that that would mean that the fish species considerations has to be broadened and it certainly has to include such species as shad and as the American Eel, and perhaps even the Sand Tiger Shark which again wasn't mentioned in the report but is not only becoming more of a species of special concern, it also is becoming more frequent in our waters or it appears to be so.

Part of my problem is that I, like you, didn't grow up an environmentalist, I became one because of staring at the river. So, as you look at these things, you see more and then once you see more, you start to see less and that becomes a problem. We are starting to see a lot less native species and a lot more altered species and this is not good for us in the long run, we are also seeing entrained in the system the American Lobster, this is a commercial fishery also and that deserves more attention, I believe, than in the report.

I'm concerned about the method of approach in monitoring, I would like to talk to Earth Tech a little bit more about this, but I understand that a lot of the monitoring happens post sweeping of the screens and I think there is probably an impingement and an entrainment factor that happens when we are not looking and that there needs to be --. I at least need more

understanding of that and a complete listing of the 77 species that are impinged and the 66 species that are entrained so that I can help evaluate what these impacts are going to be.

On two other subjects, one was there was an assessment of social justice, I believe, and by way of that an assessment of our drinking water supplies, and there was a listing of some typical water withdrawals, none of them exceeding two million gallons a day, and I do want to point out that at the ten mile limit is Silver Lake which supplies ten million gallons a day to the Brockton water supply system in the City of Brockton, which is a social justice community, and I do not believe there has been monitoring of Silver Lake, although I could be wrong, regarding emissions and those kinds of long-term impacts.

And lastly, the alternatives section discussed wind, it dismissed hydro power and although I'm not an advocate for damming our rivers and increasing hydropower, I would be curious to see an alternatives analysis given to the tidal usage of the Cape Cod Canal.

Thank you.

MR. CAMERON: Great, thank you. Thank you for those comments, Pine.

And we are going to go to Ben Morgan next, Ben?

MR. MORGAN: Good afternoon. I, like the last speaker, am going to be talking about some marine species, pretty much on the Winter Flounder is the only one that I'm an expert on or I consider myself an expert on. My name is Ben Morgan, I live in Chatham, I used to be a fisherman, now I'm currently an owner of a fish hatchery, the fish hatchery is for Winter Flounder. Winter Flounder, as previous speakers have talked about, have been deemed a moderate, I think I have the right terminology, a moderate impact instead of a small impact, meaning that there has been some mortality associated with Pilgrim's activities.

So about eight years ago people from Pilgrim and myself had worked on how to possibly make that a small impact, meaning how do you deal with this problem of killing Winter Flounder or impinging Winter Flounder? Basically, since eight years ago, we've been taking adult Winter Flounder that are natural wild stocks and spawning them. And in that process, we've basically reproduced 33 millimeter hatchery fish, which would be the same as a wild fish, and placed it out into our harbors very close to us right now, and done studies to see how they survive and if it is possible to replenish the stocks by use of hatcheries for mitigation.

And over the past eight years, we have compiled a whole bunch of data, nothing seems to be negative, everything seems to be showing that, at a larger scale, you could make this problem mitigated by the use of hatcheries, making it a small impact that Entergy has or even a no impact with Winter Flounder, I know nothing about the other ones. Basically, I can support that idea with the idea that aquaculture of hatcheries have been used for decades with replacing fish stocks, this has, we have seen this work with shellfish in Massachusetts and all kinds of other fisheries around the world.

The potential benefit to this being used as a mitigation tool would be to the community, giving jobs to the hatchery and also giving more fish for the fishermen to catch. In conclusion, I basically believe that Pilgrim could have no impact on the Winter Flounder population, in my mind, by use of hatcheries and that the benefits could really be to the communities, to the fishermen and also for jobs. I think that if we, if the number of hatchery released fish was increased, that they wouldn't have a problem to augment any potential problem associated with Winter Flounder.

Thank you, have a good day.

MR. CAMERON: Thank you, Ben.

We are going to go to Heidi, Heidi Mayo, and then to Arthur Gast. Heidi?

MS. MAYO: I would like to address the issue of Pilgrim's impact on public health, I think the commission has a responsibility to look at site-specific information on this issue. Thyroid cancer and thyroid disease are clearly radiation-linked, radioactive iodine released from reactors is drawn into the thyroid, often resulting in cancer and thyroid disease. Examples of widespread increases in thyroid cancer has occurred in the communities around Chernobyl, and Marshall Islands and Hanford, another example of this type of increase occurred right here near Pilgrim.

As a result of radiation releases in the early and mid `70s and some really big ones in June of 1982, cases of thyroid cancer and leukemia in the surrounding area were significantly elevated. Recognizing the effect of Iodine 131 on the thyroid, the NRC has implemented the Potassium Iodide Program. I have a box in my cellar for my family but I don't need it, since they weren't offering back in 1982 and now I don't have a thyroid anymore. So the draft statement that there have been no health effects here is very incorrect.

In his report to the Southeastern Massachusetts Health Study Review Committee in 1992, Dr. Richard Clapp, former director of the Massachusetts Cancer Registry, presented a graphical assessment showing elevated cases of leukemia and thyroid cancer in the towns closest to Pilgrim during the period of `82 to `89, a second graph depicted the pattern of thyroid cancer in the same set of towns, it shows a peak in the years 1987 and 1988, the year I was diagnosed. These patterns of cancer incidents are consistent with the predicted health effects of the radiation released in the early 1980s.

Additionally, the Massachusetts Cancer Registry for the years 1998 through 2002 shows a continuing increase of leukemia and thyroid cancer around here. No one knows exactly how much radioactive iodine has been and is being released from Pilgrim because there is not adequate monitoring or reporting, we don't know, I mean we do know that large releases were measured in the `70s and `80s but today no one knows what's coming out of the plant. If this plant is relicensed as is, we will never know, the least we should have is adequate real-time monitoring and reporting displayed in all communities as part of the public record.

Since the NRC recognizes the dangers of Iodine 131 to our health and Pilgrim has indeed had a negative impact on public health, this case should require a site-specific review as part of the renewal process.

Thanks.

MR. CAMERON: Thank you, Heidi.

Arthur?

MR. GAST: I had originally planned to come here tonight, I have a position regarding the station, I am a former member of the Nuclear Matters Committee, I was among the group that volunteered two years ago when the original committee all, for some reason, all resigned and I didn't understand it. I started reading the articles in the paper and letters to the editor from some of the employees who are presenting information here today and because I have a nuclear, and engineering, and construction and industrial background that goes back 50 years, I hate to say because that doesn't make me young, I thought that I ought to come down and offer my services to the selectmen to give a little balance to this.

I figured that the replacement committee would all be rabid anti-nuclear people and I was wrong, the people who volunteered was probably the finest group any small community in America could put together. We had a consulting meteorologist, we had two medical people, including the head of nuclear medicine at the local hospital, we had two nuclear engineers who had extensive background, including at the plant, who are no longer at the plant, just a tremendous number of people with very good experience.

Now I resigned a year ago, January 4, 2006, and I sent the board of selectmen my resignation and I offered my own positions because they didn't get into our reports, for reasons I don't want to get into now. But here it is, I'll just read it exactly as I sent it to the selectmen a year ago. I support Entergy's intention to apply for an extension of its NRC operating license beyond the current 2012 expiration date. My reasons are, one, this is hardly a new or dramatic change, it's the very same plant that's been operating quietly, safely and efficiently, largely out of view, having no massive cooling tower or towering smokestack, which some people want to change, for 33 years without major incident, the plant appears to be well managed and maintained and protected.

The plant produces a significant portion of our area power requirements that would otherwise need to be imported at far greater cost and environmental impact by fossil fuel-fired and generating plants burning scarce and costly natural gas or coal and oil with their negative environmental impacts or importing scarce and expensive Canadian hydro power.

Three, it produces no discharge of carbon dioxide greenhouse gas, nitrous oxide orange plume like the oil-fired plant down on the canal, sulfur oxide precursors of acid rain or mercury emission to enter the seafood chain as from coal-fired plants.

Radioactive discharge from vent stacks is negligible to nonexistent, as measured by on-site monitors meeting regulatory requirements. No shipment and unloading of heavy fuel, oil or LNG impacts our local area. While nothing involving terrorism is 100 percent predictable, the often cited vision of a 9/11 style aircraft attack is virtually precluded by the design and layout of the critical plant elements and surrounding structural supports. Similarly, the notion of a frogman entering through the sea water inlet canal and the massive centrifugal cooling water pumps without being homogenized is ludicrous.

Five, no verifiable health impact has been detected or certified to have resulted from the plant's presence or operations.

I'll just add to this our committee had Dr. Sid Nuremberg and the head of nuclear medicine at the hospital, came in with boxes of supporting evidence to say while there were spots of cancer in the town, the type of cancer caused by nuclear radiation is virtually nonpresent.

Number six, there is no free lunch to fill our national and regional energy needs. I've been involved with these alternative energy things that came up and all through the last 30 years, massive federal funding of alternative energy, coal gassification, shale oil retorting, solar energy, wind power or fuel cells have not brought significant power to our electrical grid in over 30 years of technological effort.

Opposition to oil production off-shore and on federal lands with no added refining capacity since the mid `70s has left us dependent on insecure foreign sources, and I feel that as much as anybody, I was designing refineries back in the `70s and there were no more to design. Failure to extend Entergy's operating license leaves the town with problems, if not the responsibility of removal of a derelict plant and related transmission lines and equipment.

Questions regarding spent fuel, security and the impact of revenue lost from jobs and support revenue disappearing and disposition of the plant's acreage to new uses, condos.

Much of the foregoing is based upon my career-long experience with a multitude of technologically advanced industrial plants worldwide of the size, complexity and age at least as great as the Pilgrim station.

Respectfully submitted. That's all I have to say.

MR. CAMERON: Thank you, Arthur.

Did I get everybody who wanted to speak? I know I went through all the yellow cards, at this point. We do have, it's unusual, but we do have the luxury of having some more time, at this point, and I don't think we are going to have that luxury tonight. And because Pilgrim Watch is the major group concerned, I'm going to ask Mary Lampert whether she could use ten more minutes to go over your comments?

MS. LAMPERT: At least.

MR. CAMERON: Okay. Well, there will be some, there will be some limit, but Mary Lampert and then I want to ask the NRC staff to address a couple points.

Mary Lampert?

MS. LAMPERT: Yes. I covered health, the second area of interest I would like to talk about is the section postulated accidents and I stated two factors that had to be factored in here, one was the decision of the 9th Circuit Court in California and also a proper reading of Section 5 of the GEIS. There is new and significant information regarding postulated accidents that was not considered. If considered, nobody could conclude that the result would be small. Important to consider, but it was neglected, was the issue of security, there is site-specific information that you have to consider.

First, vulnerability, what type of protection do they have? There is no protection from an air attack and despite the previous speaker, a helicopter loaded with explosives could cause a severe accident targeting spent fuel, targeting the switch yard, targeting the control room, we don't have to go on, it's an undisputed fact, they are not built to resist an air attack. Security from the water is virtually nonexistent, there are buoys which are floating no trespassing signs, period, explosives can be put up into the canal, that is why Homeland Security recommended a grate for Millstone, which they turned down.

Also, from a land attack, there is no effective security, they are dependent upon outside security arriving. However, the OSRI mock attacks have demonstrated that a force can do the job, hit the target sets in about three minutes, no way the state police, etcetera, are going to get there in three minutes. And neglected and what should be included is the spent fuel pool as being a serious target and a target of serious consequences, which Section 5 discusses that you focus on consequences. The new and significant information is the National Academy of Sciences spent fuel vulnerability study where they identified reactors that have the spent fuel pool located in the attic of the reactor, as Pilgrim, are especially vulnerable to attack.

This has gone into the dangers of densely packed pools, like Pilgrim, that are inside the main reactor building, outside primary containment at the top. In the Massachusetts Attorney General's motion to intervene, there is an attachment by Dr. Gordon Thompson, again new and significant information, that discusses the danger of a highly, densely packed spent fuel pool, fire and what the consequences would be. Again, to remove this from discussion of postulated accidents is ludicrous.

Then, by not looking at these issues, you do not come up with then, an analysis of mitigation which clearly, for spent fuel, as put forth in the attorney general's motion, would be to analyze the effect of having a lightly packed spent fuel pool and putting the rest into secured dry-cask storage. Also, an analysis should be required of the recommendations in the National Academy's study such as what fact an analysis would be the effect of, reconfiguration of the pool? What realistically is the effect of the firehose brigade, etcetera, so we can have a true analysis.

This moves into the severe accident mitigation analysis which the draft decided was, the analysis was sound which, again, if you really looked at it, you could not come up with that conclusion and I hope they will look at it more seriously again. The licensee, the applicant, used the MACCS II code, they are not restricted, by the way, of only using that code, but what is important is what goes in, what are the variables, the input data, because obviously that would effect the analysis of what the consequences are and the input data clearly is lacking.

For economic data, they put in the average property value of farm and non-farm property, they did not look at, for example, the added value of an ongoing business enterprise, clearly a manufacturing plant is valued at far more than the bricks and mortar that go into it. In doing an analysis of alternative sources of energy, there was an analysis of historic, you know, value of the area and what the impact would be, but it is not in the SAMA analysis for Pilgrim. Clearly because this area has such great historic value, also clearly because of our beautiful seaside location, that impacts and raises the values of our property. Tourism is here because, not to come to these meetings, obviously, but because of the history that's here, because of the seaside location and that would be gone and has to be factored in.

Not also considered properly were two emergency planning variables, one, evacuation delay time which is, in English, notification. They stated that the public would be notified, at max, within six hours, that makes assumptions which aren't true, that sirens can be heard inside the houses, which they can not be heard inside. What about an accident happening at night? What about the fact that some sirens are not going to operate? You cannot expect part of the fire or police department and DPW to cover over 125 square miles to notify people who are doing different things, clearly this is just, that people will be ready to get out of here in six hours is unrealistic.

Evacuation speed, again, a very unrealistic time was put into the formula because it had faulty emergency planning assumptions, they overlooked, for example, the shadow evacuation. There is an assumption that everybody outside whatever the zone is is going to stay home and go about their business, we know, from Three Mile Island, we know from telephone surveys that were done after that people outside the ten miles, people close to Boston will be hitting the road, putting a cork, so to speak, in the bottle, so that people here are not going to be able to get out in the timely manner that was assumed.

We also know that there is nothing magic about the ten miles, so the evacuation speed is how long it's going to take to get from, let's say, my house in Duxbury to just a little bit past the magic ten miles in Marshfield. Again, we know from the Sandia National Labs studies, we know from study, after study, after study that there is nothing magic about the ten miles so to assume the consequences end at that point and we can call an evacuation successful once you cross the ten miles is patently absurd.

And so because of the problems with the severe accident mitigation analysis, what it does is falsely minimize consequences so the cost of mitigation seems not necessary, as described for

the direct torus vent system, and we could go through many other mitigations that should be relooked at, but the key is you have to do an honest analysis to begin with, which was never done.

The next area was nonaccident view to radioactive waste. Again, small impact, how can there be a small impact? Because, number one, when you are looking at spent fuel, it is assuming there is validity to the fantasy of the Nuclear Waste Confidence Act, that somehow Yucca is going to be there, or a radioactive waste fairy is going to come or God knows what they are assuming. But we know reality and one of the NRC commissioners was quoted in all the papers yesterday, Commissioner Merrifield, that he has no confidence in Yucca and that we, essence, should start again from zero. So, without looking at and providing a plan of what people are going to do with this high level waste, how can one say then that there is no impact?

The same could go for low level waste, low level waste is a misnomer because it is everything but the spent fuel and it can have some highly toxic and long-lived radio nucleates in it. Entergy is a major producer of this stuff, the new and significant information that was overlooked was that Barnwell, South Carolina, which takes our waste, has said by June, `08 the door is shut, also they say in the draft that they have confidence that other sites will be built. That's baloney, there has been millions of industry money spent to try to find a site in Illinois, etcetera, etcetera, etcetera, and no new sites have been built because nobody wants it.

Massachusetts had the beginnings of a search in the `90s and they stopped looking, so what is going to happen to this? Again, if it is the plan, if it is not realistically looked at and a plan is not put forward, you cannot analyze it and say it's going to be no problem. And so what we will have on our eroding coastline on Cape Cod, subject to increasing storms from global warming, etcetera, etcetera, etcetera, turning into a high level and low level radioactive waste dump until my kids are my age. This has to be analyzed and faced honestly, okay?

The next issue that I would bring up--

MR. CAMERON: Mary, could you just make this the last one?

MS. LAMPERT: Yeah. Is, if you are talking about waste, is transportation. Again, the transportation, God knows, let's pretend that there will be a Yucca or there will be someplace to put the stuff, then the issue is how is it going to get there? The draft brightly says impact small, how do they know it's going to be small? A, what's the plan? I've read the plan in DOE and apparently 24 barges are going to South Boston to be put on a railroad to go through like Chicago, does anyone in their right mind think this is going to happen when one of the casks per barge has 40 times the radiation in the Hiroshima bomb?

Do you think Cohasset, Hingham, Senator Lynch, how about the people in South Boston? He will be lynched, but the point being that these issues have not been looked at seriously because of my general comment in the beginning, that the draft is playing games by pretending that

rules, policy that the NRC has are real and that because the plan is there and it's going to happen that we don't have to worry about it so it's significance is small. But we are not dealing with, we shouldn't be dealing with fiction but, in reality, when you read this, that's where this belongs.

Again, thank you, Chip.

Transcripts of the Evening Public Meeting on January 24, 2007, in Plymouth, Massachusetts

[Introduction by Mr. Cameron]
[Presentation by Ms. Williamson]
[Presentation by Ms. Hurley]

MR. HAYNES: I'm Bob Haynes, President of the Massachusetts AFL-CIO, I represent 400,000 working families here in the Commonwealth of Massachusetts and I get to do testimony at the statehouse and occasionally at Congress or whatever.

And I have to say, first of all, you guys are all workers and I've never been at a hearing where people ask questions and then people that were sent here to answer them answer them, so I congratulate you all. This executive summary, this impact study is a terrific piece of work. It's a little too comprehensive for me, but I congratulate you for your good work.

I'll try to be as brief as I can. Obviously I'm here to say that we need this power--

MR. CAMERON: Would it help you, you can come up here and you can just put your notes down, it may be easier for you.

MR. HAYNES: We obviously need this power, it's reliable, it's safe, it's low cost. We need the Pilgrim Nuclear Power Station. We frequently hear in Massachusetts that we are losing population, we are losing jobs, especially young people, to other parts of the country where work is more plentiful and cost of living is lower. The consequences of loss of the people and loss of jobs means the rest of us need to pick up a higher proportion of those costs here in the commonwealth.

And one of the big costs, one of the big cost drivers in the Commonwealth for families obviously is higher energy cost and one way to stem the tide, if you will, is to keep Pilgrim open and in operation. Pilgrim provides some of the lowest cost and most reliable power available on our grid and another price contributor is the demand for electricity in Massachusetts is growing, but new supplies are not. If you are in some of our urban areas, there is a tremendous amount of growth taking place, some major buildings being constructed across this commonwealth.

And when you take a look at the new economy here in the Commonwealth of Massachusetts, biotechnology, health care, computer technology, developers, all require vast amounts of energy to supply the laboratories and the life saving medical equipment, clean rooms and data

centers. Obviously working families here in this Commonwealth need these industries in this new economy to thrive. Massachusetts has gone through a tremendous transition in the last ten years from a manufacturing-based economy to this sort of new age economy, if you will.

We need the energy produced at Pilgrim for our necessities and for those new technologies that become staples to our way of life. We need nuclear power here in the Commonwealth, we need Pilgrim for three reasons pretty simple to me, as a representative of 400,000 working families in the commonwealth. The three reasons are jobs, jobs and jobs. We are talking about losing 700 good jobs here at the station, including 400 union workers, and I will say about the 400 union workers that they are highly trained, highly skilled, incredibly experienced professionals that are hard to replicate in this economy and we don't want to lose these good jobs.

These workers keep Pilgrim Nuclear Power Station safe, and productive and to not renew this license would be to displace them and that would jeopardize our energy supply, hurt our local economy and devastate their families. There is an obviously economic impact, $135 million in annual economic activity. A very significant fact is that the Pilgrim plant purchases services from more than 75 Massachusetts companies, so you can see that the spread of that economic impact is dramatic here.

Let me just close, let me just be as brief as I can here.

From a regional economic jobs and quality of life standpoint, we need both the electricity and the jobs that Pilgrim Nuclear plant provides. If we know that the plant is safe, which it is, if we know the workers are experienced and skilled, which they are, if we know these workers need these good jobs, which certainly they do, if we know the power is produced at low cost and is indispensable to our grid, which is true, if we know the contribution Pilgrim makes to the state's economy are immeasurable and irreplaceable, which they are --. I lost my fourth page. Then there are no reasons why the Pilgrim Nuclear Power Plant should be denied license renewal but rather a host of reasons why it should be allowed to continue being a key focal point of our energy and economic future.

And I want to say, you know, that this is a wonderful opportunity, this civic engagement, the opportunity to speak in public about things that are so important to us and for somebody that has represented workers for 30 years here in the Commonwealth of Massachusetts, this is a good example, a good relationship with the company, and the union and the workers, doing good work for the community, so please relicense the Pilgrim Nuclear Power Station for the benefit of the community. Thank you very much.

MR. CAMERON: Thank you. Thank you, Bob, for those comments and also your remarks about the meeting.

And we are going to go to Gary, Gary Sullivan. And Gary, why don't you just come right up here, thank you.

MR. SULLIVAN: Thank you. I'll wait until I get to the mic before I say anything. I have no idea what that guy was saying on his way up there, but let me just thank him for taking all of my speech, President Haynes.

My name is Gary Sullivan, I represent the workers at Pilgrim Nuclear Power Plant, I'm very proud of those workers. I'm going to be very brief here.

In my opinion, this is a no-brainer, jobs are so important. We represent not only the workers at Pilgrim Power Station, we represent workers at fossil plants up in Cambridge, up in Everett, in South Boston, in Charlestown, in Weymouth and I could tell you the training that the people receive down at Pilgrim to run that plant is second to none, I have never seen anything like it.

I can also tell you that the majority of my members that work at that plant live around the plant, which says something. They are proud of what they do there and they feel completely safe with themselves and their family, that is quite a statement. Over 85 percent of them live in Plymouth and Barnstable County. Now it was spoken earlier about the energy situation, especially here in the Northeast, and I can tell you that we are, we are very close to being in crisis here in the Northeast when it comes to power.

With the growth in demand of electricity and the lack of generation, I think it would be not only a disservice to the workers and the community that would be hurt by this closing or non-renewal but it's a disservice as well to the energy grid and the fact that getting alternative energy sources like wind power. I mean if we are having trouble with wind power and new alternative sources, we cannot discard a source and a resource like Pilgrim Nuclear Power Station.

So I just want to say, in closing, I think we have an obligation to our society and the fact that this power is needed on the grid. I think we have an obligation to the community that it serves and the fact that the people that work there thrive in the community. This plant exudes community involvement, I mean you cannot get a better example of how a business is helping a community.

So I hope I wasn't too long, that's all I want to say. Thank you for your time and thank you for caring enough to be here for this issue.

MR. CAMERON: Thank you. Thank you very much, Gary.

And we are going to go to Joyce, Joyce McMahon, next.

MS. MCMAHON: Good evening. My name is Joyce McMahon, I am the Director of Communications for the Massachusetts Affordable Reliable Electricity Alliance, Mass AREA for short.

First, let me thank you for taking this opportunity to address the commission, we do appreciate your time. Second, I would like to tell you a bit about Mass AREA and why we felt it was

important to be here. Mass AREA is a diverse, state-wide group comprised of more than 65 labor, trade associations, businesses, including Entergy, educators, scientists, advocates and community leaders.

Earlier today, we heard from some other Mass AREA members, which included the South Shore Chamber of Commerce and Massachusetts Associated Industries and tonight we heard from some of our labor groups. As a group, we are committed to finding clean, low cost and reliable electricity solutions that benefit all of Massachusetts, it is an urgent public policy challenge. We came together one year ago after several warnings were issued by the Federal Energy Regulatory Commission, ISO New England and others that energy supplies will be insufficient to meet peak demand as early as 2008 and that energy prices are causing hardship for the region's businesses and residents, especially the most vulnerable such as the elderly and low income populations.

While Mass AREA's mission is brought in focus to include new electric generation in the form of renewable energy resources, improving the transmission infrastructure, developing new natural gas supplies and encouraging energy efficiency, Mass AREA and its members fully support a license extension for the Pilgrim Nuclear Power Plant. On a typical day, Pilgrim station provides seven to nine percent of the Commonwealth's electricity. Without it, Massachusetts and the region as a whole could face power supply shortages, including rolling blackouts, a lot sooner than predicted.

Perhaps one of the most important issues that led Mass AREA to support a license extension for Pilgrim is the fact that the plant operates safely and continuously earns the NRC's highest safety rating of green. We also know that NRC staffers are on-site at the plant each and every day overseeing operations and helping to maintain a safe and secure environment. The production and distribution of electricity, whatever the source, is inherently a challenging safety issue, yet nuclear power has proven safe. In 50 years of commercial operations, there has never been a radiological death at any U.S. nuclear plant.

Mass AREA and its members are also comforted in the knowledge that Pilgrim's owners work diligently with state and local emergency officials, some of their programs include giving the local communities radio equipment so that they all operate on the same frequency and conducting extensive training sessions to make sure everyone is prepared in the event of an emergency, be it plant-specific or a natural occurrence such as a hurricane or a blizzard. The real danger is a scenario that Massachusetts will face if the state does not have enough affordable and reliable electricity.

Blackouts aren't simply an inconvenience or a temporary loss of business, blackouts cause death because people who are already frail and infirm can't get the heat or cooling they need to sustain life. High prices are a danger too as they cause folks to curtail electricity use and again result in real life safety concerns and possible harm.

Over the past several months, there have been a few proposals for new power plants but most are small, still the largest proposal, Cape Wind, faces significant opposition and the smaller

units have not even begun the very long siting process. As such, it becomes even more vital that we maintain our current supply, including Pilgrim.

Opponents of the Pilgrim Power Plant often say we would be better off if the generator was decommissioned. However, the baseload power that would replace Pilgrim would most likely come from sources that are more expensive, far more polluting or both. At this time, wind and other renewable energy technologies simply cannot generate the massive baseload power that would be needed were Pilgrim to cease operations. Moreover, the electricity that Pilgrim supplies is created without generating any greenhouse gas emissions and therefore it does not contribute to global warming.

Pilgrim also mitigates the production of hundreds of tons of sulfur dioxide and nitrogen oxides, chemicals which are harmful to human health, especially among children and the elderly, these health and environmental benefits alone are enough argument for renewing Pilgrim's license to produce power. From an economic standpoint, since the owners of the plant sell their power through long-term contracts and not on the volatile short-term market, the power produced at Pilgrim is much lower cost than the regional average.

Massachusetts ranks fourth in the nation in terms of highest electricity costs, couple that with our high housing and health care costs and it becomes even more important to maintain Pilgrim's very reliable, low cost electricity so that we don't continue to have an exitus of residents and businesses from our state who can no longer afford to live or work here.

Speaking of work, Pilgrim is also an important source of jobs, it has more than 700 permanent full-time employees, most of whom live in Plymouth and the surrounding communities, indeed Pilgrim supports the local economy to the tune of $135 million annually in local economic activity. Though the draft environmental impact statement noted a moderate socio economic impact should the plant cease operations, we believe those who would lose their jobs would face large economic and financial loss.

In summary, Mass AREA has weighed all of the environmental, economic and energy supply traits of Pilgrim, particularly its long record of safety, and concluded that the Pilgrim Nuclear Power Plant is vital to the region, state and local community for three reasons. First, its environmentally sound operations; second, its economic contribution to the local community through the provision of jobs and purchase of goods and services; and third, its provision of reliable, low cost electricity. Mass AREA encourages the NRC to grant Entergy's Pilgrim station an extension of its license so that it can continue to safely operate for an additional 20 years.

Further, we urge the Atomic Safety and Licensing Board to consider the Pilgrim related matters before it as quickly and expediently as possible while the license renewal process takes its natural pace.

Again, thank you for the opportunity to speak with you tonight.

MR. CAMERON: Thank you very much, Joyce, and thank you again.

And we are going to go to Mary Lampert, at this point.

MS. LAMPERT: Yes. The NRC staff improperly concluded the cumulative impacts would be small, the analysis was improper for the following reasons. First, they ignored or misinterpreted new and significant information pertaining to Pilgrim that has occurred since the generic environmental impact statement was written in 1996. For example, the health impact was determined to be small because they misinterpreted that National Academy's BEIR 7 by saying the recent report was very, didn't differ, differed very little from the previous.

In fact, it stated that the incidents of cancer would be a third higher than previously thought, that women were 37.5 percent more likely to get cancer, that workers exposed to the allowable maximum dose, one in four would get cancer. Also, they ignored in the draft the continued pattern of increased radiation-linked diseases. A look at the cancer registry by the former founder and Director of the Massachusetts Cancer Registry and a professor at Boston University has seen a continued increase, elevated levels, of thyroid cancer, leukemia, multiple myeloma, prostate, to name a few.

They also misinterpreted the Southeastern Massachusetts Health Study, the state study that found a fourfold increase in adult leukemia. And I understand they now appreciate that they misquoted or misunderstood and will be going back to DPH, the authors of that study and the assistant commission have held, have stated equivocally, and I will include their e-mails and correspondence in my written testimony, that they stand behind that study.

The second reason that the draft found small impacts results from incorrectly assuming the current NRC regulations, many of which are written in the 1970s are, a, they are being met by the licensee, and that these regulations themselves reflect current realities and are indeed protective of public health and safety, so they more or less put us in a catch-22. An example is that the draft found spent fuel that would be half again, as much generated over the relicensing period was of small impact because of the assumption that this stuff will have someplace to go. Even Ed McGaffigan, a Commissioner of the NRC, said Monday the Yucca Mountain program is deeply flawed and that folks better start looking someplace else. Also, another example would be they are assuming that the regulation that doesn't require monitoring wells on-site unless the water is used for drinking is satisfactory. Clearly it is not satisfactory and it will not pick up leaks of contaminated water from buried pipes and tanks, for example, and the topography of the land is such that leaks, if they are there from either buried pipes or tank or from the waste that has been buried on site and denied, goes into the bay.

Third, they regard the impact as small because they ignored the impact of spent fuel in postulated accidents and they ignored terrorism. There are two significant factors that require them, before they move forward in this decision, to look at terrorism and also to look at the impacts of spent fuel in a postulated accident, one is the 9th Circuit Court decision in California that was asked to address the question whether the NRC need consider terrorism on licensing decisions under NEPA, they answered yes. This process is a significant licensing situation so, therefore, this is a factor that has to be looked at. The Supreme Court was asked by the

licensee in California to review the case and they refused to do so, meaning they concurred.

The second issue is involving spent fuel, spent fuel has to be looked at under the section of postulated accidents. If you look at the GEIS, the GEIS or whatever, it says, it describes in Section 5 explicitly environmental impacts of postulated accidents, they define severe, they define accident and they don't limit either to the reactor. They do this, however, in Section 6 which deals with exclusively normal operations and that's where they say the spent fuel doesn't have to be considered.

So, what does this mean? All the new information that we have about the dangers of spent fuel storage at Pilgrim provided by the National Academy of Sciences, indicating that the way the fuel is stored at Pilgrim is among the most dangerous in the country, an analysis has to be done on the lack of security from an air attack, from water, land and then an analysis of the various mitigations to decrease risk such as a requiring a dense, a low density pool, secured dry cask storage, what about reconfiguring the pool? What about alternative water, spray water systems? This has to be analyzed and put forward.

Because, which I find interesting, because they avoided talking about spent fuel, avoided talking about terrorism, this helps explain their conclusion that these alternative sources of energy, such as wind, solar, gas, etcetera, would have a greater impact, would be more expensive, would be all these other things. Clearly, if you look at, if you factor in security, if you factor in waste, if you factor in a true analysis of consequence where the attorney general, for example, a report to him indicated a specific consequence analysis of a spent fuel accident of Pilgrim, that if 100 percent of the cesium 137 was released, it would bring about $488 billion in damage. If ten percent of that were released, $105 to $175 billion. If 100 percent were released, which is likely in a terrorist attack situation, 24,000 cancers, ten percent, 8,000 cancers.

Now, seriously, who here is concerned about a terrorist attacking a wind farm? So what if they did? You would never have the consequences that we have here. So, because nuclear has been described as cost effective, it's because these true costs are not put into play, it is the most heavily subsidized industry. If you describe it as safe, as former speakers had, it's because you are not looking at what the consequences of either a reactor accident or of a spent fuel accident, God forbid, would be. And if you are looking at is as safe, I think I've already covered that.

And so, by continuing to ignore the realities, what we are doing is depriving ourselves in the future of a cleaner, safer and cheaper source of energy for ourselves and for the generations down the pipe.

Thank you.

MR. CAMERON: Thank you very much, Mary, thank you.

Bill Harris?

MR. HARRIS: Good evening. I want to talk about the economic impact of Plymouth station. My name is Bill Harris, I'm from Duxbury. I'm a local business owner, I'm also a concerned citizen.

I support relicensing of Plymouth station, nuclear power is the only viable long-term solution to our energy needs. It's cost effective, it's reliable, it's clean. Plymouth station is one of the largest local employers, it's one of the largest local industries, the majority of Plymouth station employees live in the county. In addition to protecting land, making sizable charitable donations to local nonprofits, Entergy and Entergy employees pay taxes, taxes and fees that go to the local operating budget, the local schools, the local police and fire.

Payroll at Entergy or payroll at the station is $55 million between permanent employees and contractors, that's $55 million injected into the local and surrounding economy, that's $55 million going into local shops, local restaurants and most important, our local housing market. Plymouth station is a valuable part of the local and surrounding community, I support the relicensing of Plymouth station.

MR. CAMERON: Thanks a lot. Thanks, Bill.

How about Brian? Brian Thurber? Brian?

MR. THURBER: Good evening. My name is Brian Thurber and I work as the energy coordinator for Clean Water Action, Clean Water Action is a statewide and national environmental public health advocacy organization with roughly 33,000 members in Massachusetts. Thank you to the commission for the opportunity to provide comment on the draft environmental impact statement, my comments will be extremely brief. We strongly support the efforts and comments of Pilgrim Watch and the Office of the Attorney General of Massachusetts, among other groups opposed to relicensing of the Pilgrim Nuclear Power Plant.

We concur with conclusions that the draft environmental impact statement ignores new and significant information and relies on incorrect assumptions about NRC regulations, as they relate to environmental and public health impacts. The Pilgrim plant suffers from the same persistent problems of safety, security and storage as the nuclear industry in general.

Even within the narrow scope of this review of the impacts of relicensure, there are significant impacts that should be grounds for denying the extension. Daily radiation releases, the vast amounts of radioactive waste stored indefinitely on-site at the plant, damaged fisheries and the risk of a terrorist attack are just some of the compelling reasons for letting the plant be decommissioned at the end of its planned life span in 2012.

And just specifically regarding the comment about global warming that I believe Joyce McMahon made earlier, I just want to point out that, you know, studies have shown that the life cycle of creating electricity from a nuclear power plant is actually greenhouse gas intensive because you include the fuel processing.

And then also I just want to comment that I was surprised to see the broad-brushed conclusion that alternatives to relicensure have moderate to large impacts necessarily, I mean that's obvious of course with fossil fuel plants but with alternatives, including renewables but especially efficiency and conservation, it's very hard to argue that the impacts would be anywhere close to large in terms of negative environmental and health impacts and, when you are talking about cost effective, I mean that's obviously the way to go.

Given the many unanswered or inadequately answered, inadequately answered concerns about the environmental and public health impacts of extending the life of this plant, we respectfully ask that the commission deny the relicensing of the nuclear power plant. We strongly believe that this plant does not deserve another 20 years of operation and the South Shore and the rest of Massachusetts definitely does not deserve another 20 years of the impacts from this plant.

Thank you.

MR. CAMERON: Thank you, Brian.

Our next three speakers are Michael Scherer, Richard Rothstein and Bill Stone. And, Michael?

MR. SCHERER: Good evening. My name is Michael Scherer, I am a fish biologist and I was, until about a year ago, the President of Marine Research down in Falmouth.

About a year ago, Marine Research was acquired by a much larger environmental consulting company, Normandeau Associates, and I'm now a vice president of that company. I've been working on fisheries issues at Pilgrim station for most of my professional career which has spanned about 32 years, so I can appreciate the amount of material that needed to be gone through to prepare the EIS.

I will prepare detailed comments, but I wanted to offer a couple of short ones tonight and they concern the moderate finding that the plant would have a moderate, relicensing could have a moderate impact on the Winter Flounder population and also on the smelt population. The moderate impact finding on Winter Flounder was based largely on what's called the equivalent adult model which takes numbers of eggs and larvae that pass through the plant and predicts how many adults would, could result from those based on many assumptions on their mortality rate. It's a screening tool and it's not designed to estimate mortality rates.

In 2000, 2002 and 2004 I was involved in what we call a larval transport study designed to measure how many Winter Flounder actually flow past the station in a typical spawning season, and based on that study, we estimated that much less than one percent of the Winter Flounder

larvae passing the station are actually entrained, so I would urge you to focus on that more than the equivalent adult model.

With regard to Rainbow Smelt, the moderate finding was based on numbers impinged, which average about roughly 1,500 a year, and all of those fish were attributed to the Jones Rives. There are approximately 21 Rainbow Smelt runs between Cape Cod and Boston of varying sizes and, since Rainbow Smelt is a coastal species, it seems unreasonable to assume that all of them come from that one system.

Thank you.

MR. CAMERON: Thank you very much, Michael. And Richard, Richard Rothstein?

MR. ROTHSTEIN: Good evening. I'm Rich Rothstein, I'm a Plymouth resident and I also am a member of the Town of Plymouth Nuclear Matters Advisory Committee, although tonight I'll be speaking on my own behalf.

And you've heard comments pro and con about the relicensing and my objective in joining the committee two years ago was to try to ensure that whatever decisions are rendered would be based on good science and engineering, not hearsay, rumors, innuendos, etcetera.

I'm a board certified consulting meteorologist and have been working in the environmental consulting profession for the past 35 years, was heavily involved with the design, licensing and operation of nuclear power plants domestically and internationally in the 1970s and became heavily involved with nuclear emergency preparedness planning programs following Three Mile Island in the early, during the early 1980s time frame.

I'm going to limit my comments tonight briefly just to the adequacy of meteorological databases and models that were used for the off-site consequence analysis that was discussed in Chapter 5 of the supplement EIS. You'll note that in the appendices, that Appendix A, I believe, that contained comments from the scoping meeting, public scoping meeting, that took place last summer, there were a number of questions and issues raised about the adequacy of the MACCS II software code that was used for doing the air quality analyses, meteorological analyses for use in the studies.

And I guess the response to those comments indicated that this would be addressed or discussed in Chapter 5, although I didn't see any simple or extensive discussion in Chapter 5, it just gave the results, so I would like to see Chapter 5 or somewhere in the appendices in the SEIS give a more in depth discussion of justifying the use of that type of code for purposes of the modeling and dose calculations for the off-site consequence analysis that went into the cost/benefit studies.

Now I know some of the commenters had referred to, and I'm not going to get too technically jargonny here, but Class A and Class B air quality dispersion models, and these are modeling concepts that the NRC developed back in the `70s and `80s time frame. I'll just say that the MACCS II code is more like a Class A model, very simplistic, assumes straight winds, any given

hour, and can be applied pretty quickly, and the Class type B models were never really fully implemented for use because they are quite cumbersome, expensive numerical models, needed a mainframe computer probably about half the size of this room.

The good news is that, since the early 1980s, that modeling techniques have been advanced and models are a little simpler to apply, you can use some of these complex models now, variable trajectory wind flow models on a PC. An example of these types of models can be found in 40CFR, Part 51, Appendix W, that's the OCPA's guideline and air quality models, and an example of a model that can be found there is the Cal-Puf model which can be applied for shoreline complex wind flow environments, such as those that exist in the Pilgrim region.

And I realize this is not part of nuclear emergency preparedness planning, in terms of the relicensing, but those kinds of models can also be applied and adapted for use for operational studies and accident analysis studies, including the SAMA type of studies too. And I brought up that model in particular because the NRC's contract, Earth Tech, was the, some of my colleagues who had worked at Earth Tech were involved with the development of that Cal-Puf model, so I know the folks from Earth Tech know what I'm talking about here.

I'd just like to close to say that I would like to see NRC come up to speed, such as other federal agencies have had in the last decade or so, and use realistic, accurate modeling techniques for a number of different applications. And I think the sooner this is done, the more credible and realistic the analyses will be and that will only help promote and advance perhaps the advent of even newer reactor technologies down the road, so things don't get delayed due to questionable analyses.

Thank you.

MR. CAMERON: Thank you very much, Rich, for those comments.

And Bill Stone?

MR. STONE: I'm a Plymouth resident and have been for 34 years, my wife and I and my children live in the town, my grandchildren live in the town. And as a resident of Plymouth, I know of no environmental problems that Pilgrim has created, according to what I've read from Mass DEP, the Federal EPA or the NRC. I own a company that manages approximately $250 million worth of real estate, my concerns, as far as the environment are concerned, is whether or not we are going to be able to replace the production, the electrical production, that comes if Plymouth is allowed to go off-line.

One of my concerns is that Massachusetts is continuing to slip as an economic powerhouse, our young people are attracted to other areas. We do know that they are leaving because there are lower costs for housing, for health care and for energy costs. Businesses, such as mine and others, small and large, remain adversely affected by their monthly electric bills. As a number of you are aware, we had deregulation in Massachusetts approximately six years ago and our firm has, for example, already taken advantage of every energy efficient program and

product available for properties that we manage such as dialysis centers, women's health centers, breast care facilities, sewerage treatment plants and other residential properties that we manage.

A number of businesses in Massachusetts, as we know and have enjoyed, have been engaged in research and development. We also have to think about the simple things, such as how do our supermarkets keep our food from spoiling as far as freezers are concerned, which run 24 hours a day, all of us enjoy going to the ATM, getting money out 24 hours a day, these things have to be run on electricity. We do have a number of hospitals that were in contact, they have inordinately high electric bills and most of them are operating, as we know, 24/7.

All of us on the South Shore have enjoyed our way of life and I think we have to look at that as actually a result of cheap energy. Deregulation happened for business in 2000. In 2006, I've looked at my energy bills, as a businessman, and I'm sorry to say that I've watched, as I pay my bill to National Grid, that my kilowatt per hour cost has gone from 6 to 7 cents per kilowatt hour, to 2006, it's gone as high as 12 cents per kilowatt hour and, looking at the month of January, it's gone from 12 cents per kilowatt hour to 13.82 cents per kilowatt hour, that's a 17 percent increase this month.

Now none of us probably should be alarmed, but what are we going to do when Pilgrim is off-line? As we have heard and as we know, we have had problems approving the wind energy program in the, off the coast and I look at Pilgrim as a plant that actually produces electricity at a lower kilowatt hour cost to us than a number of other alternatives. We cannot even approve a wind energy program when the Dutch have been using it for 800 years, we really have a problem and the problem is that we need to get beyond ourselves and we have to look at a situation where we have a reasonable cost of producing electricity and we have to be honest.

The most significant accomplishment in Massachusetts, I'm sorry to say, in the last year, is young Joe Kennedy appearing on television thanking the, if you will, Communist leader of Venezuela, Hugo Chavez, for giving us free oil and lower cost oil to give to our poor and our elderly. I think that we really have a problem if that's one of our most significant energy accomplishments in Massachusetts. I do look at it as, and I've listened to a number of people, Pilgrim has produced jobs, the people that work at Pilgrim are our neighbors, we have been living with them for 35 years, there has been no issues. We do have cost effective power, they live beside us, what's the problem?

And my greatest concern is that we in the United States continue to slide in comparison to other countries. We are looking at and we know from the *Wall Street Journal* that the Chinese are building 80 nuclear power plants, the French are building 20. I would rather have my future depend on the United States Nuclear Regulatory Commission than thinking about the Republic of Korea or thinking about a third world country developing nuclear power. I know the Nuclear Regulatory Commission has been criticized, I'm sorry for that, but obviously it's a great country and we can all disagree, but I think we all do finally agree that it is the best country around.

The people who built Pilgrim have done a better job, for example, that the Russians. The people who maintain Pilgrim have done a better job than anywhere else, I think we have to recognize it. I think we need to keep our children near us in Massachusetts, our grandchildren near us, and we now are dealing with the slow down, if you will, on the redevelopment of power plants. I am concerned about the workers who do work at the plant, we do have 400 or 500 families, I would be very sorry to see them go.

And I think we need to deal with the realization in fact of what are we going to do in 2012 when we have rolling brownouts, when we have them adversely effect hospitals, nursing homes, dialysis centers, and places where we buy our food and live our lives? We continue to slip because our costs for housing, health care and energy are not being replenished, we have to look at our situation realistically. Over 100 years ago, we all dammed up our rivers and that was a pretty big economic and environmental impact because we needed to create power to create jobs to run our mills, our manufacturing plants, and that's a problem that hasn't really hurt us either.

I think we are dealing with obvious technological advancements, we are dealing with people who care about how the energy is produced, who live beside the plant, who live in our neighborhoods and I think we need to recognize that Pilgrim should be relicensed. Thank you.

MR. CAMERON: Thank you very much, Bill.

Our next speaker is Kevin, Kevin Craig?

MR. CRAIG: Thank you to the NRC for the opportunity to talk tonight, I'm going to try to limit my comments to what the NRC has done, what the staff have done specifically about the generic environmental impact statement because I don't think that this is an issue of whether the plant should be open or closed in the future, I think it's an issue of whether this statement has been adequately prepared, and whether all the issues have been adequately studied and whether there should be additional work done in terms of protecting the plant, so let's try to keep it at that level.

I don't get this thing that's repeated often in the study which is there is no new information. It's repeated in several sections that specifically concern me because I see new information and the two sections of the report where I don't see acknowledgment of new and significant information that concern me is, one, the section that deals with the environmental impact of the fuel cycle's radioactive waste and the second section is the environmental impact postulated accidents. There are fixable issues here, even given the new information that I believe exists, but what the NRC needs to do, I believe, is expose these issues and then force resolution of the issues.

And I believe that these issues are related to the aging process because they get worse as time goes on, the more that the plant operates, the worse they get. I mean one could make an argument that these issues are related to the routine operation of the plant, but a circuit board that's routinely operating over a period of 20 years and as it heats, and gets hotter, and more

brittle and eventually will break, something that happens in the spent fuel pool as a result of 20 additional years of operation that could increase the probability of an accident needs to be addressed because then I call it an aging issue.

Now we might be splitting hairs in terms of the linguistics here, but here at are the two issues, one issue, the environmental impact of the fuel cycle's radioactive waste. There has always been a question of what's the environmental impact of large amounts of stored radioactive waste as a result of Pilgrim's operation from the current license as well as the renewed license, and what I'm referring to is the vast amount of harmful waste that's produced, excluding the fuel, spent fuel waste and the fuel rods.

And the answer to this question has always been that it's satisfactorily addressed in these kinds of studies on a national level with scenarios that deploy off-site storage. So we just get it out of Pilgrim, off-site storage facilities and the possibility down the road of a yet to be determined Yucca Mountain Site, which we heard discussed earlier, but I think there is new and significant information that hasn't been taken into account that sort of nullifies these answers and these ways of sort of pushing the issues aside.

First, we heard earlier about Yucca Mountain, it's not going to open as predicted for the disposal of the waste and I believe somebody said that one of the NRC commissioners is now acknowledging that. I think that's pretty new information in my mind. Certainly, if it ever does open, it isn't going to open as predicted, it's going to be a long period off which means you are going to have more and more waste stored up and it's going to have to stay on-site, I believe. Because of the second factor, this second piece of new information which is that an announcement has been made that there is going to be a closing of a key facility where this radioactive waste is dumped, that's a facility in South Carolina that's capable of taking this waste.

This facility takes many classes of this waste, I guess this waste is broken up into four or five different classes, there is high level, there's mixed waste, and this plant takes it all or most of it. And these GEISs require that the analysis that the NRC accounts for the adverse impacts associated with this issue of radioactive waste and if no information is discovered in the GEIS, this is my understanding of the way this works, the generic environmental impact statement, then the issue is called settled, it's been settled at the national level and we don't have to deal with it here at Pilgrim.

But if new information comes forward and it applies specifically to Pilgrim, which is what I'm contending here is that we've got the closure of these facilities, that's going to affect Pilgrim because we are not going to have a place to put this, there is no plan B here, then the issue is a Pilgrim issue and either the NRC or Entergy should acknowledge it and deal with it for the residents.

I'm a resident here. By the way, Kevin Craig, I'm sorry, I didn't introduce myself. Kevin Craig, resident in Duxbury. I'm a member of the Duxbury Nuclear Advisory Committee, but I'm here on behalf of my neighbors and the citizens of this area.

So if the issue is local, then it's going to have to be assessed for obvious reasons and mitigated in this Pilgrim SEIS, that's my feeling. Either way you look at it, national or local, the issue has to be addressed and it wasn't, there was really no mention of this information. Both NRC and Entergy in this book kept stating that they are not aware of any new information that would effect the Pilgrim environment, I feel that this will effect the Pilgrim environment. What's the impact of this new information on this report? The primary impact of this information is that Pilgrim needs now to assess how much waste is going to be on-site, with the assumption that there is going to be a lack of off-site storage.

The residents need a plan B, I need to know that somebody has thought through this, not to say, oh, we'll fix it later, it'll come. There has got to be a place for safe storage of this waste at the site, I want to see a plan for it because this could happen. The plan and assessment need to be evaluated in this SEIS report, that's my feeling. Furthermore, the quantification of this issue needs to be addressed in terms of volumes and curies of radioactive isotypes that will be coming out of the plant as a result of decommissioning, even after 2032, if the license were extended.

It's not just an issue for the next 20 years, in my feeling, when you put this SEIS report together, you've got to think about what happens after decommissioning, assuming that we don't have a third renewal. The secondary impact of this new information on the SEIS report is that the quantities of radioactive waste are now an attractive target, if they are on-site here, for terrorists who are set on spreading dirty bomb contamination that's going to destroy the environment and harm the health of our citizens, which is what this environmental impact statement is all about.

So there is a whole host of issues and additional mitigations that need to be addressed from this increased risk and the severe impact of terrorists targeting a build up of radioactive waste on the site as a result of a lack of places to put it around the country because, a, Yucca Mountain isn't going to go on schedule, b, this facility in South Carolina that takes many classes of this waste is closing. I think it's closing in 2008, this is the Barnwell, South Carolina.

I hope I have my facts right but I'm sure, this is what your job, is to take my facts and then sift through them.

But I am happy to see that the NRC has acknowledged something that Pilgrim admitted which is that there is, with this radioactive waste, a "irreversible and irretrievable resource commitment needed", that's as far as things went in this report or in this application. The Pilgrim application for the license renewal lists this commitment that's needed for radioactive waste as simply, and I put this in quotes too because it's right in the application, "land is required to dispose of spent nuclear fuel and low level radioactive wastes". So this is the closest that the applicant's environmental report and the NRC's DSEIS came to addressing this issue, which I think has new and significant information. It's very disturbing to me that nobody has acknowledged it and made a plan B.

The second issue, environmental impact of postulated accidents, that's Section 5, is that right? Thanks. This involves spent fuel and specifically the above ground pool and, again, new and significant information here, no mention of it anywhere. I'm just stunned, absolutely stunned. The issue is that, what are the risks associated with a spent fuel pool accident? And the answer to this question has always been similar to the first one, that the issue has been satisfactorily assessed on a national level with scenarios that assess the possibility of some leakage from the spent fuel pool and, as well, the answer always involves that there will be, there is some normal amount of density of fuel in the pool and that a leakage will result in a manageable scenario.

New information, in my opinion, new and significant information never acknowledged in here, number one, 9/11 event, the 9/11 event, plus discovery of nuclear facility files on computers of fundamental terrorist organizations changes everything for me. I think it changes the probability of a, what's referred to in the report as a postulated accident, it changes the scenario that's mapped out as a manageable pool leakage to a pool drainage or, at best, the elimination of circulation of the water in the pool which has, as you'll see, as you'll hear, disastrous consequences.

The national, just to back up to this business about fundamental terrorist organizations, and I'm just not talking off the top of my head based on the headlines in the news, the National Commission on Terrorist Organizations issued a 2004 staff paper suggesting that al Qaeda initially included nuclear power plants among their expanded lists of targets, aside from the World Trade Center, the Pentagon, etcetera, for their 9/11 attacks. So this is a national commission that was put together after 9/11 that stated this.

This new information, again, changes the whole scenario here, it doesn't take a classified intelligence report to figure out how determined individuals could cause these scenarios to take place right from our backyard, the Plymouth Municipal Airport or another nonmonitored airstrip in the region. I think this is also new information. Again, it's come since the GEIS was developed, it's come within just the last few years and it gives us an opportunity to reassess the possibility of a sabotage attempt as a higher possibility or a higher probability than was originally postulated when people went through these scenarios and said this is not an issue.

Prior to 9/11, the NRC had no way of sort of estimating the likelihood of some sort of sabotage at a nuclear facility. As a matter of fact, I'm going to quote from a document, an NRC document, "there is no established method ... for quantitatively estimating the likelihood of a sabotage event at a nuclear facility". This is from a report from the NRC prior to 9/11, June, 2001, a briefing on spent fuel three months prior to 9/11. Since then, again, new information. We have an attack, we have mention of nuclear facilities in al Qaeda documents and I think immediately even a statistician, who knows nothing about terrorism, says, oh, we have a probability, we have some probability we can estimate, so this is new information.

Second, new and significant information on this issue of the spent fuel pool, the original GEIS assessed the fuel pool accident probability and impact or since the original GEIS assessed the probability and impact of spent fuel pool impact when it was assessed as a leakage that can be

managed, the Pilgrim, locally here, fuel rod densities have been increasing substantially due to the lack of off-site fuel rod storage and a lack of an approved on-site cask storage plan. At the same time, there are credible scientific reports, that are new and I think significant, that have been published that essentially state that above ground spent fuel pools are the most dangerous method of storage and when they are tightly packed, the danger increases.

So the tight packing is new, the reports that this is a danger and the most dangerous form are new and the consequences of that packing, which I'll get to right here next, is also new. In 2005, a National Academy of Science report to Congress, which was a report that was sponsored by the NRC and the Department of Homeland Security, described a scenario with the partial loss of pool water where the fuel rod cladding or the casing of the fuel rod catches fire.

The first, this scenario was first described years ago by Sandia National Laboratory which is a very famous laboratory, so it's been described by several scientists is my point here but very recently by the NAS on behalf of the NRC and the Department of Homeland Security in a report to Congress.

Other credible scientific reports found in the *Journal of Science and Global Security*, for example, have new and significant information of a more specific nature on this issue, they explain how a major human and environmental disaster would result from the overheating and burning of a protective fuel rod cladding in a densely packed pool. They describe how the fire could easily release, result in the release of massive amounts of radioactive product, cesium being the worst, and that, in its report that I referred to, to Congress, the estimate of cancer deaths from a typical scenario with a cesium release is from 2,000 to 6,000 deaths. I would say that's a significant impact.

A full release would dwarf Chernobyl's release, based on the amount of cesium at Pilgrim. I believe it's, our spent fuel pool at Pilgrim has several times the amount of cesium that was in existence at Chernobyl and released at Chernobyl. The Massachusetts Attorney General has a report, and I think it was referred to by an earlier speaker, that describes the consequences of such an accident at Pilgrim, specific to Pilgrim, they are between, in these terms for somewhere between a 10 and 100 percent release of the cesium.

So, if 10 percent is released or 100 percent is released, somewhere in that range, this is the range of the consequences in that report for Pilgrim. The cost would be somewhere between $105 and $488 billion and the cancers would effect somewhere between 8,000 and 24,000 people, that's significant. What's the impact of this business of the spent fuel pool and this new information on the SEIS report that we are talking about here tonight? Well it would seem that this new information raises a red flag, and this information has come forward only in recent years and it's directly applicable to Pilgrim's densely packed spent fuel pool, and it's going to get worse with age, the packing gets more intense.

Both the applicant's environmental report and the NRC's DSEIS have stated there is no new and significant information on spent fuel that might impact the environment. There is mention

at some point, I think the previous speaker to me said that there was mention of something about the spent fuel pool and how there could be mitigation measures using dry cask storage and the like but, right now, as it begins to become packed, well prior to cask, dry cask storage being implemented, it is an increasing danger, the fire that we are referring to.

So it was also surprising to me that I found out from this report to Congress recently that Entergy has begun studying the pool fire scenarios and even they said there is no new and significant information on spent fuel.

So, summarizing again the second issue of the fuel pool, there is significant and new information, from my perspective, as follows, there is an increased probability of a spent fuel pool attack from the air, there's two very realistic scenarios that are deployable and that hinge on weak points in the building as well as local airstrip safety systems that are inadequate, but I won't discuss those, they are security issues.

Two, an increase in the density of the pool's fuel rods, three, scientific reports that are fairly recent where everybody is beginning to acknowledge the severe human and environmental impact posed by an accident in a more densely packed pool, especially the above ground type of Pilgrim, I mean that's what's really the problem here. These are fixable problems, however, this is not a statement that we've got to shut the plant down tomorrow, these are fixable problems, but somebody has got to shine a spotlight on them and make sure that we start talking about a plan B, a resolution of these problems.

So I urge you to consider this information for the sake of kids, and my neighbors and the citizens not just of Duxbury where I live, but Plymouth, and Kingston, and Marshfield and places 20 miles beyond where if there was a severe accident, people would be effected for hundreds of miles, actually.

Thank you.

A.6 Letters and E-Mails Received on the Draft SEIS

From: RoycePenstinger@aol.com
Sent: Tuesday, January 16, 2007 7:22 PM
To: PilgrimEIS@ nrc.gov
Subject: Comments on the Draft EIS.

PNPS-D-A

1. The following comments are submitted by Sherwood Martinelli, a stakeholder at large for the Pilgrim Nuclear Reactor, and a member of the public living within the 4 mile circle of death around the Indian Point Nuclear reactors located in New York. Sherwood Martinelli claims right of stakeholder, as Pilgrim is a fully owned subsidiary of Entergy Corporation, the same company that operates the Indian Point reactors, and decisions made as relates to said Pilgrim reactor establish a precedent that affects the outcome of a pending Entergy intention to file an application for renewal/re license for the number 2 and 3 reactors at Indian Point. These comments are alleged specifically against not just the Pilgrim plant, and in opposition of the re licensing of this failing facility, but as much as possible are a condemnation of and a verified complaint against every nuclear reactor in America, a verified complaint against the nuclear industry, and further, and allegation against the Nuclear Regulatory Commission itself who has implemented a plan that places company profits ahead of human health and safety, as well as the being and protection of our environment.

Generically the Draft EIS is environmentally racist, fashioned in such a way as to mitigate and or eliminate from consideration in the license renewal process any and every element ,of the Pilgrim Nuclear Reactor specifically, and all license renewals in generally, that negatively impacts the community (community and those within it are in fact and deed an environment unique unto itself, and occupied by members of the animal kingdom, specifically human beings) being forced to accept the ongoing operation of this unsafe, and fatally flawed reactor, and specifically attempts to ignore A) the environmental impacts associated with the physical degradation of the reactor and it's component parts, B) refuses to properly factor in the cumulative effects of the environmental degradation from continued operation of the plant past it's date of license expiration, and C) wrongfully tries to remove from the consideration process of re licensing serious safety and security issues at the plant that present very real and imminent dangers to both human health and the environment. Further, said application, and subsequent Draft EIS rely upon out dated and no longer accurate data and assumptions, since the human inhabitation within the area of impact surrounding the Pilgrim Nuclear Power Plant has dramatically changed since the original grant of license for said facility. Further, the reactor itself, and all reactors in the American fleet are no longer the reactors that were originally licensed by the NRC.

Before going into the specific problems this commenter has with the EIS, and the things it attempts to eliminate from consideration, the following environmental and constitutional justice concerns are hereby raised, and as much as possible are raised as A) a verified complaint and allegation against the NRC, DOE, George W. Bush, and the entire nuclear community (nuclear industry, and those organizations that support it such as the NEI), and B) to be construed as addressing and including into said allegation any and all individuals, corporations and government agencies both here and abroad that have participated in the criminal allegations here by alleged and C) where appropriate, are to be turned over to the United States Attorney Generals Office, GAO or the NRC's deplorably weak in-house investigators for investigation and/or prosecution.

1. The DOE, NRC, NEI, various assorted federal laboratories and George W. Bush, as well as key members of his staff have in fact and deed colluded with all key players within the nuclear power industry to artificially prop up, and renew a failing industry here in America and abroad in a wrongful attempt to extort money from both rate payers, and American Tax payers in direct

violation of the RICO Act (Title 18, United States Code, Sections 1961-1968) and specifically, 1962(c).

2. The collusion between member corporations of the nuclear industry, their lobbying arm NEI, and members of the United States government have in fact and deed negatively impacted upon the quality of this comment filers life, negatively impacted the true value of real estate value of statement filer, and put said filer in a situation of grave financial risk should a nuclear incident occur at any nuclear facility in America, as a result of the wrongful passage of, and extension of the Price Anderson Act that limits the financial liability of the owners of Nuclear Power Reactors here in America.

3. Members of the Nuclear Industry, certain non-profit organizations, members of certain universities long associated with DOE (MIT), and various departments and facilities associated with the government of the United States of America have in fact and deed through private meetings and quietly orchestrated work groups conspired to force funding into, and create a scenario whereby Nuclear is forced on America as the only workable option to resolve Global Warming, as it witnessed by the program Nuclear Power 2010/GNEP as will be proved by all the underlying documents that unveil the steps implemented over a period of over eight years by the afore mentioned individuals and groups to position nuclear as the favorite horse in a wrongful attempt to give nuclear energy a rebirth both here in America, and abroad. In short, we have an orchestrated RICO like attempt to not only prop up a failing industry, but to extort money from both rate payers, and the American tax payers with the help of every level of our American Government up through and including President George Bush who was bought off with overly generous donations to his campaign war chest.

General Allegations

NRC in collusion with their licensee for the Pilgrim plant, as they have done at every other plant who has progressed through the re licensing process is wrongfully attempting to ignore and remove from the re licensing process certain key issues of consideration:

1. Leaking Spent fuel storage facilities associated with, and a part of the very license renewal process now under review. The spent fuel pools are an integral part of the reactor, and in fact and deed are routinely used as a part of the reactor fueling and operational process. The spent fuel pools in fact and deed are attached too, a part of the whole of a reactor, just as all other component parts are, including values, panels, the control room and the core itself. If a application to extend a license is granted, the licensee is not going to be forbidden from using and accessing this important part of the process, and in fact and deed a reactor cannot continue in operation without a safe, secure, functioning spent fuel area that does not threaten the environment, that is not leaking materials (which is a sure sign of wall fatigue, and a sign of potentially imminent wall collapse) and present no unacceptable risks to human health. The NRC is wrongfully attempting to remove consideration of the spent fuel pools at reactor sites to protect first their licensees, secondly the industry's cash flows, and lastly the DOE who has failed completely in keeping their promise to the American public in safely dealing with and removing waste from nuclear reactor sites. How many accidents have been hidden from us as members of the stake holder community? For instance, I've heard rumors/reports here in the community surrounding Indian Point that a huge gaping hole was cut into the fuel pool at Indian Point 2, and that said gash leaked over 1,000 gallons of water into the ground on a daily basis for over a year while management argued with Under Water Welding on how to handle the problem...true...I am not sure, but I have reason to believe the source was/is legitimate enough to raise the issue.

2. Known structural issues with the reactor, and it's component parts including the reactor, it's core, pipes, gauges, valves, control room and all other necessary buildings and parts necessary to the questionably safe operation of this experimental technology are wrongfully being removed from the re licensing review by claiming they are design flaws covered under the original application process. In fact and deed, the reactor now operating at the pilgrim facility is not the same reactor approval for original operation. The NRC's own internal documents on this, and every nuclear facility in America that are being kept from serious public scrutiny show an aging fleet of reactors that are requiring and ever increasing amount of maintenance and repairs to keep them limping along. Most disturbing of these repairs, is the use of patching of known cracks, fissures and out right structure breaks with the use of various welding techniques meant to keep the reactors operating at all costs. Problem with this, is two fold. First, much like a boiler, this welds numbering into the thousands, including ones in the core itself create new weak points along the outer perimeter of each and every seam. Even more disturbing, much of this weld repair is being done blind in the core of the reactor itself with unmanned welding machines, with no real way of verify the quality of the job, nor providing ways for visual inspect of these weakened inner core areas. Secondly, the patches, and the welds that create them are constantly mutating the noise technology parameters used to warn human operators of internal core dangers...in short, each patch, each weld adds new sets of false signals that have to be figured out and solved as the industry plays Russian Roulette with our lives, the NRC content to let us as a community pray that the next guess, and the one after that, and the one after that is ALWAYS the right one. As George Bush has said about Homeland Security as relates to terrorism, we have to be right 100 percent of the time...running a reactor under that kind of a mind set and regulatory oversight scenario is begging for a cataclysmic nuclear incident here in America. Mathematical modeling lets us know, that humans will make errors, it is a foregone conclusion, and eliminating from review the physical aging and brittling of these antiquated relics of years gone by, asking communities to trust an industry and a regulatory agency with a record of putting profits ahead of safety and human health is unacceptable, and it is imperative that every license renewal include as a part and parcel of the process a full and complete safety and security assessment. These assessments are being asked for by our members of Congress on a case by case basis, and time again the requests fall on deaf ears...if in fact, as the industry is claiming, these facilities are structurally sound and safe, it would make sense that they would welcome even ask for these assessments themselves to assuage public fears.

3. Security standards are inadequate at all the nuclear reactors, and the NRC has deliberately removed security complaints from the re licensing process, just as they have refused to give any serious consideration to a terrorist attack on these vulnerable facilities.

4. The NRC, USEPA and other agencies of both state and federal government have wrongfully narrowed the scope of environmental issues with Indian Point, and have steadfastly refused to consider the cumulative effects of the known environmental problems on both human health, and the environment. Further, they have refused to do a qualitative on the cumulative effects of dumping almost one trillion gallons of 100 degree irradiated waster waters back into the Hudson on a yearly basis, or too consider the cumulative effects nationwide of over 100 trillion gallons of heated water being dumped into our water ways.

5. When management at Pilgrim and other plants have been unable to meet safety criteria and 10 CFR rules, they have been granted exclusions, or the NRC issues general issue notices that then excuse all reactors from solving a given issue...there are currently 1,000's of these in existence.

>>> "Joan Bartlett" <jhbartlett4@comcast.net> 01/18/2007 2:31 PM >>> PNPS-D-E

I am writing to request that part of the negotiations between Entergy and the Town of Plymouth include the preservation of the Entergy land so that - for safety reasons - no more development will take place near the plant.

The approximately 1600 acres of land now owned by Entergy has been preserved by the owners of Pilgrim Nuclear Power Plant since it received its license in 1972. I would suggest that continued preservation of the land be formalized into a Conservation Restriction as part of the re-licensing negotiations.

The possibility of a terrorist attack on Pilgrim goes well beyond mere speculation. The 9/11 Commission has documented the fact that nuclear facilities had been among the original targets of the al Qaeda terrorists. When Pilgrim was licensed and built in 1972, its location was in an area that was remote and undeveloped. At the project planning stage, the initial site chosen by Boston Edison at the Quincy Naval Air Station was rejected because the area was too heavily populated. The ultimate site in Plymouth was chosen because it was a sparsely populated area.

However, the population around the plant has changed drastically in the last 30 years, and this aging plant is now located in the fastest growing region in Massachusetts. In Pilgrim's backyard, Pinehills, the largest housing development in New England, is under construction. The build-out includes 2,877 homes on 3,060 acres, and Pinehills is actively trying to acquire more land to build in this area. The distance from Pilgrim to Pinehills is about 3 ½ miles. The current Pinehills household size is 1.95 people per building. Based on these numbers, there will soon be 5,850 people living just a few miles from the nuclear plant. For safety and evacuation reasons the 1600 acres Entergy owns should remain as open space.

This is a rare opportunity to achieve a goal in which both negotiating parties might benefit: Entergy by proving its bona fides as a good corporate citizen; Plymouth for the reasons described above.

Sincerely,

Joan Bartlett

From: Rebecca Hall [mailto:longpond@mac.com]
Sent: Sunday, January 28, 2007 10:48 PM
To: PilgrimEIS@nrc.gov
Subject: Re-licensing 2008

PNPS-D-X

I am against the re-licensing of Pilgrim in 2008. I believe that Pilgrim and the cancer rates in the region are related.
I believe the high levels of mercury in my body are related to Pilgrim.
I believe there will be more investment in Plymouth, if Pilgrim is stopped. Presently, and for decades, Pilgrim has been a dark shadow of legitimate concern in the region. Everyone knows in his/her heart that Pilgrim is the wrong energy choice for our future.

Thank you,

Rebecca S. Hall

Formerly of Plymouth. Now New Mexico. One reason I left Plymouth was because of the health and safety fears around Pilgrim.

PNPS-D-Y

NRC FORM 659
(6-2003)

U.S. NUCLEAR REGULATORY COMMISSION

Category
3

NRC PUBLIC MEETING FEEDBACK

Meeting Date: 01/24/2007

Meeting Title: Pilgrim Nuclear Power Station Draft Supplemental Environmental Impact Statement Public Meeting, Plymouth, MA

In order to better serve the public, we need to hear from the meeting participants. Please take a few minutes to fill out this feedback form and return it to NRC.

1. How did you hear about this meeting?

- [ ] NRC Web Page
- [ ] NRC Mailing List
- [x] Newspaper
- [ ] Radio/TV
- [ ] Other _____

	Yes	No (Please explain below)	Somewhat
2. Were you able to find supporting information prior to the meeting? Didn't try	[ ]	[ ]	[ ]
3. Did the meeting achieve its stated purpose?	[x]	[ ]	[ ]
4. Has this meeting helped you with your understanding of the topic?	[x]	[ ]	[ ]
5. Were the meeting starting time, duration, and location reasonably convenient?	[x]	[ ]	[ ]
6. Were you given sufficient opportunity to ask questions or express your views?	[x]	[ ]	[ ]
7. Are you satisfied overall with the NRC staff who participated in the meeting?	[x]	[ ]	[ ]

COMMENTS OR SUGGESTIONS:

Thank you for answering these questions.

I'm an ordinary Duxbury resident who lives 5 miles downwind of the Plymouth Power Station and believe in nuclear and coal power. I have two comments: why?

1) I don't understand why the NRC doesn't require a license extension to be contingent on updating the Plant to today's available technology instead of a patch work approach.

OVER

Continue Comments on the reverse.

OPTIONAL

Name: Malcolm MacNaught

Organization: ordinary Taxpayer

Telephone No. Malcolm MacNaught

E-Mail

[ ] Check here if you would like a member of NRC staff to contact you.

OMB NO. 3150-0197 Expires: 06/30/2006

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Please fold on the dotted lines with Business Reply side out, tape the bottom, and mail back to the NRC.

COMMENTS OR SUGGESTIONS: (Continued)

B/ I presume there will have to be a complete failure of a continued pond before the NRC and in particular Congress provides a permanent depository for the spent rods as promised 40 years ago

spent rods as promised 40 years ago

UNITED STATES
NUCLEAR REGULATORY
COMMISSION
WASHINGTON DC 20555-0001

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PNPS-D-Z

From: Heidi Mayo [heidimayo@comcast.net]
Sent: Sunday, February 18, 2007 1:15 PM
To: nrcrep@nrc.gov
Subject: Response from "Comment on NRC Documents"

Below is the result of your feedback form. It was submitted by

Heidi Mayo (heidimayo@comcast.net) on Sunday, February 18, 2007 at 13:15:28

Document_Title: DRAFT SUPPLEMENTAL ENVIRONMENTAL REVIEW (SEIS) Draft NUREG-1437, Supplement 29

Comments: I wish to sign on to the comments submitted by Pilgrim Watch dated February 5, 2007, and especially with the statements on impacts on health.

Since I am a statistic - one whose health has been impacted by operations at Pilgrim station - I know the SEIS is incorrect.

Thyroid cancer and thyroid disease are clearly radiation-linked. Radioactive iodine released from reactors is drawn into the thyroid often resulting in cancer and thyroid disease.

Examples of widespread increases in thyroid cancers occurred in communities around Chernobyl, Marshall Islands, and Hanford. Another example of this type of increase occurred near Pilgrim. As a result of radiation releases in the early and mid 1970s, and some big ones in June of 1982, cases of thyroid cancer and leukemia in the surrounding area were significantly elevated.

Recognizing the effect of I131 on the thyroid, the NRC implemented the Potassium Iodide (KI) program.

The Draft Statement (SEIS) that there have been no health effects here is very incorrect.

In his report to the Southeastern Massachusetts Health Study Review Committee [June 26, 1992] Dr. Richard W. Clapp, former director of the Massachusetts Cancer Registry, presented a graphical assessment showing elevated cases of leukemia and thyroid cancer in the towns closest to Pilgrim during the period 1982-1989. A second graph depicted the pattern of thyroid cancer in the same set of towns. It shows a peak in the years 1987-1988 – the year I was diagnosed. These patterns of cancer incidence are consistent with the predicted health effects of the radiation released in the early 1980s.

Additionally the Massachusetts Cancer Registry for the years 1998-2002, shows a continuing increase of leukemia and thyroid cancer around here.

No one knows exactly how much radioactive iodine has been, and is being released from Pilgrim – Because there is not adequate monitoring and reporting.
We do know that large releases were measured in the '70s and '80s but today no one knows what's coming out of Pilgrim. If this plant is relicensed "as is" we will never know. The least we should have is adequate, real-time monitoring and reporting displayed in all communities as part of the public record.

Since the NRC recognizes the dangers of I131 to our health, and Pilgrim has indeed had a negative impact on public health, this case should require a site-specific review as part of the renewal process.

organization: Pilgrim Watch

address1:

address2:

city: Plymouth

state: MA

zip: 02360

country: USA

phone:

PNPS-D-AA

From: artforumkingston5622@comcast.net
Sent: Sunday, February 25, 2007 10:44 PM
To: pilgrimeis@nrc.gov
Subject: Extending the operational life of Pilgrim Nuclear Power Plant

Dear Nuclear Regulatory Commission Members Overseeing Pilgrim Nuclear Power Plant :

ISN'T IT COMMON SENSE TO PLAN THE SHUTDOWN OF PILGRIM NUCLEAR OVER THE NEXT 5 YEARS ?

(INSTEAD OF PLANNING TO EXTEND ITS LIFE FOR AN ADDITIONAL 20 ?)

WHY IS IT THAT INDUSTRY'S IMAGE AND LIABILITY IS MORE IMPORTANT THAN FULL DISCLOSURE ?

WHY IS IT THAT A GOVERNMENT AGENCY BACKS AN INDUSTRY THAT IS, IN THE LONG RUN, A DANGER TO LIFE FORMS ON THIS PLANET?

1. The mining, refining, preparing fuel rods, transporting, set-up, monitoring, regulating, storing , etc. are, actually, prohibitingly expensive, and has been supported by government funds from the very beginning. Nuclear power is NOT cheap.

2. Highly radiactive particles (especially in the gaseous state) are given off into the environment in every stage from mining to processing, to producing, to usage in plants, to secondary reprocessing and then years of storage - the methodology of STORAGE, of course ,has not been tested for "centuries "- only theorized. Just WHERE do radioactive "tailings" go ?? Nuclear power is NOT cheap.

3. Many radioactive elements seriously damage the molecular composition of living cells as the elements decompose and given off high energy particles/radiation. Thousands of Japanese are still dying from the effects of our nuclear bombs (as are their descendents) due to genetic damage from the same radiation. (Why should human life, or, rather ALL life, on earth be placed in jeopardy in order to produce electricity ?) The tailings from mines, the water and chemicals used, spent rods etc., etc..... are all dangerously radioactive. Where does the radioactive waste go? To Bankok? To Sri Lanka? To the bottom of the ocean? Who transports it, who pays them? Nuclear power is NOT cheap !

4. What about depleted uranium ..... Did you forget that 1000's of leaking barrels of depleted Uranium have contaminated the underground water supply of Paducah Kentucky....where 38,000 cylinders of depleted Uranium await SOME KIND of disposal as well as those at enrichment facilities in other states ?

When will Pilgrim's overly populated cooling tower be depopulated and WHERE will the rods be taken....and who will pay for their very carefully orchestrated removal and transportation?

Nuclear power is NOT cheap.

5. What about the radioactive GASES given off such as XENON 137 which decays into CESIUM 137 (half life of 30 years) ? What about water around nuclear reactors where tritrium

has been absorbed... Tritrium is absorbed by living cells and can stay in the body from 1 to 25 years....causing cellular defects such as tumors , retardation, etc. etc. It is also taken up by plants, not just animals like us.

You say, perhaps..."Well, there is danger in all forms of energy....." but the danger doesnt persist for centuries ! What about XENON 135 that decays into CESIUM 135 (half life - 3 MILLION years)? Etc., etc., etc.

Nuclear power is NOT cheap.

6. EVERY 1000 megawatt nuclear power plant produces 30 TONS OF RADIOACTIVE WASTER PER YEAR Does Pilgrim Nuclear use dry storage casks? cooling pools ? They're still "tight" and "safe"? For how long? and then what ? Are the trucks or ships or railroads and proper containers now being designed and built to move the radioactive wastes to _____(wherever) .....did you say YUCCA Mountain ?? Oh, yes, YUCCA Mountain. Well, that's better than under the sand dunes of Cape Cod, thank you..

NUCLEAR POWER IS NOT CHEAP !

7. Everyone knows about Chernobyl ..."it" happened almost 20 years ago. The cement used to cover over the meltdown hole is settling, cracking, disintegrating. Millions of people "downwind" throughout Europe have suffered all kinds of medical problems since then . What does the future hold? What about Three Mile Island ? It took eleven years to clean up the site and the reactor building is still intensely radioactive. PILGRIM NUCLEAR is one of the oldest reactors.....one of the "MODEL T's" of the industry.

NUCLEAR POWER IS NOT CHEAP AND IT IS NOT IN THE LONG RUN SAFE.

8. Now what?

Surely the development of SOLAR CELLS cannot be MORE expensive to develop and maintain than the life span of a nuclear power plant. Solar will be "on line", pardon the pun, in the next 10 years. PYRON-SOLAR (SanDiego, CA) has teamed up with BOEING-SPECTRALAB to create a solar arrray of glass magnifying lenses that gather sunlight and focus it onto a photovoltaic panel which creates direct current to split water into hydrogen and oxygen...with a 37 % to 40% efficiency !

YES it used a lot of energy to produce this array. BUT it uses the sun for fuel thereafter. And sunlight is cheap. SEE: info@pyronsolar.com SEE: www.lionhellas.com. See: info@freedomenergysolutions.com

There are many more sites to peruse .

SOLAR ENERGY IS CHEAP, ALONG WITH WIND, WATER AND TIDE.

9. I could go on and on (the readers of this, if any, probably would agree!) However.....

MY POINT IS that ,yes, the United States has a great deal of electricity generated by nuclear power but now with computers, nanotechnology, world-wide research and growth in solar, wind,

water, and tidal power....once these really get going the world will not need to accumulate the tragically dangerous wastes of nuclear power and ,hopefully, NOT those from nuclear weapons !

(DO TELL, IS THERE A CONNECTION BETWEEN NUCLEAR "POWER" AND NUCLEAR WEAPONRY?)

(Hmmmmm.)

The power of the future is not radioactive. It is simple, free and there is no end to it.

SUN, WINDS, WATER, AND TIDAL POWERS ARE CHEAP, once the initial development price has been paid. A great deal of research is underway which continually makes sustainable energy sources increasingly "cheap" and increasingly available.

10. Five years from now, PILGRIM NUCLEAR PLANT will be five years more mature than it is now. It is one of the model T's of the nuclear industry. It will be time, then, to put it to rest ! It will take at least five years to decide just how, indeed, to put it SAFELY to rest so that for the next, say 100 to 400 0years, it's radioactive reactor parts and wastes and the surrounding earth will not threaten the diverse life forms of southeastern Massachusetts, Cape Cod and Massachusetts Bay. Please start deciding.

11. DEAR NUCLEAR REGULARTORY COMMISSION MEMBERS OVERSEEING PILGRIM NUCLEAR: PLEASE USE COMMON SENSE AND PLAN TO SHUT DOWN PILGRIM NUCLEAR IN FIVE YEARS !

JUST THINK.....ROUGHLY 50 SQUARE MILES OF SOLAR ARRAYS CAN PROVIDE ENOUGH ELECTRICITY TO MEET ALL OF THE ELECTRICAL NEEDS OF THE UNITED STATES OF AMERICA ! ONE THING WE ALREADY HAVE IS PLENTY OF DESERT OUT WEST AND PLENTY OF ROOFTOPS IN OUR TOWNS, CITIES AND COUNTRYSIDE.

THE CHINESE ARE ALREADY CONSTRUCTING THE BASIC MATERIALS FOR CAPTURE OF SUNLIGHT. PYRON AND BOEING AND OTHERS ARE ALREADY UNDER CONTRACT IN OTHER COUNTRIES TO ESTABLISH SOLAR POWER COLLECTOR ARRAYS SO THAT DENMARK AND OTHER COUNTRIES DO NOT HAVE TO RELY ON EITHER NUCLEAR POWER OR THE OIL GIANTS.

(Nuclear power is NOT cheap.)

Thank you

Lilias Cingolani

Kingston, Massachusetts (once part of early Plimoth) USA

PNPS-D-BB

From: MARMERRY@aol.com
Sent: Monday, February 26, 2007 9:26 PM
To: PilgrimEIS@nrc.gov
Subject: (no subject)

Attachments: Letter of Introduction 3.doc; Sales and Marketing.doc

1. I am an advocate of nuclear power and am in there midst of putting together a program to include the potential of nuclear plants being part of the transition from carbon based technologies to hydrogen over the next twenty years. Instead of defending the past and the current maybe it would do you folks a great bit of good if you were positioning yourselves against your adversaries for the future at the same time speaking their language, How can a no - nuke disregard programs eliminating green house gases and creating an overall better environment.

For example !!! Nuclear facility production of hydrogen for alternative fuel programs based on hydrogen resulting from the process could power all the cars in the future. Not to mention create an alternative power source for all carbon based proposals. I understand you've lived this tale before but maybe it will help with the new (consumer) awareness of global warning that's supposedly leading the charge to new technologies.

You probably get a lot of e-mails like this and are hesitant to reply. I am presenting an alternative energy program to the senators in my state in the couple of weeks and would appreciate your thoughts. I have included a resume to let you get an idea of my background.

I would like to discuss the potential of the Plymouth facility being the catalyst for the production of hydrogen fueling the alternative fuel movement. My background in sensors and respiratory protection programs has afforded me a unique view into the suppliers of energy, their curses and their opportunities.

I'd enjoy taking some time discussing an opportunity to take you facility to the forefront of the new wave in energy'

Wouldn't hurt selling the bottled water either.

Thanks for your time and best regards,

Joseph A. Marino

Please find additional comments below and in attachment as to my oral presentation, January 24, 2007, in Plymouth, MA. PNPS-D-CC

Please acknowledge receipt of this statement.

Rebecca J. Chin - rebeccajchin@hotmail.com

Rebecca Chin – Vice-Chair – Duxbury Nuclear Advisory Committee

NUREG 1437 supplement 29, Draft

NRC's Draft SEIS is inadequate in that the NRC staff mistakenly concluded the Applicant's SAMA Analysis was "sound." The SAMA analysis was faulty in that Entergy entered partial and selective data into the model and thereby underestimated consequences to make mitigation alternatives, such as the Direct Torus Vent System, appear not cost effective The purpose of a SAMA review is to ensure that any plant changes that have a potential for significantly improving severe accident safety performance are properly analyzed identified and addressed. One example of how a poorly performed SAMA analysis can lead to erroneous conclusions is the Pilgrim Environmental Report's look at the costs and benefits of installing a Direct Torus Vent filter at Pilgrim.

The Direct Torus Vent System (DTVS) is a method to relieve the high pressure which is generated during a severe accident.

In 1986, it was determined that the Mark I containment, especially being smaller with lower design pressure, in spite of the suppression pool, has a 90% probability of that containment failing. The purpose of the containment is to provide a barrier between the lethal radiation inside the reactor and the public. In order to protect the Mark I containment from a total rupture it was determined necessary to vent high pressure buildup. As a result, the "Direct Torus Vent System" at all Mark I reactors, including Pilgrim, was installed. Operated from the control room, the vent is a reinforced pipe installed in the torus and designed to release radioactive high pressure steam generated in a severe accident by allowing the unfiltered release directly to the atmosphere through the 300 foot vent stack. Use of the vent discharges steam and radioactive material directly to the atmosphere bypassing the standby gas treatment system (SBGTS) filters normally used to process releases via the containment ventilation pathway. There is no radiation monitor on the pipe and valves that comprise the DTV line. Operators now have the option by direct action to expose the public and the environment to unknown amounts of harmful radiation

As a result of Pilgrim's design deficiency, the original idea for a passive containment system has been dangerously compromised and given over to human control with all its associated risks of error and technical failure.

There appears to be an internal contradiction in what we are being told. "The NRC believes that the release from a severe core-melt accident would be reduced [by the suppression pool] by a factor of one hundred. This is considerably more optimistic than estimated in the NRC's first study on the subject. Also, the contention is that the reduction by a filtration system would have zero benefit. Here the contenders seem to be assuming that a factor of one hundred equals 100%. That is false. Even a release of 1 percent of the core's radioactive iodine and cesium would be a very severe event.

In its Environmental Report, Entergy analyzes the benefits of installing a filter to the torus vent in the course of reviewing possible severe accident mitigation alternatives.

Their Report states, this analysis case was used to evaluate the change in plant risk from installing a filtered containment vent to provide fission product scrubbing. A bounding analysis was performed by reducing the successful torus venting accident progression source terms by a factor of 2 to reflect the additional filtered capability. Reducing the releases from the vent path resulted in no benefit." The Report then states, "Basis for Conclusion: Successful torus venting accident progressions source terms are reduced by a factor of 2 to reflect the additional filtered capability. The cost of implementing SAMA at Peach Bottom was estimated to be $3 million. Therefore this SAMA is not cost effective for [Pilgrim]." Entergy has determined that in return for a cost of $3 million, there will be no benefit to public health and safety.

How it is possible to find zero benefit from installing a filter that would reduce by a factor of two the radioactive venting to the public in the case of a severe accident?

Unfiltered venting has been judged unsafe by all regulatory agencies outside the United States. In its analysis of several risk contributors to Core Damage Frequency, the disposition of those events frequently included "venting via DTV path to reduce containment pressure." In other words, a filter in the torus vent could reduce the impact in many possible severe accidents. The only conclusion to draw from the outcome of the DTV filter SAMA analysis is that, Entergy has used the MACCS2 code to downplay the health and economic costs of severe accidents and used the Probabilistic Safety Analysis (PSA) model to make the benefits of mitigation appear to be zero.

NRC staff reviewed Entergy's analysis and concluded that the methods used and implementation of those methods was sound. And "the costs of SAMAs evaluated would be higher than the associated benefits. 5.2.5. The NRC staff is wrong to accept Entergy's SAMA analysis in the application.

The SAMA analysis included in the Pilgrim Environmental Report is incomplete.

Not only does the probabilistic modeling for severe accidents artificially make consequences appear insignificant, but the Applicant has used incomplete and incorrect input parameters into the MACCS2 code.

The direct torus vent filter as an example of how this cost benefit equation might have been skewed in favor of no mitigation "While NEPA does not require agencies to select particular options, it is intended to 'foster both informed decision-making and informed public participation, and thus to ensure the agency does not act upon incomplete information, only to regret its decision after it is too late to correct' It then said "if 'further analysis' is called for, that in itself is a valid and meaningful remedy under NEPA." The Applicant has drastically under counted the costs of a severe accident, and this could have led it to erroneously reject mitigation alternatives. Further analysis is called for.

EPA has acceptable standards for exposure, in the real world; there is no safe level of exposure to radiation.

In conclusion, the danger of NRC rubber stamping Entergy's SAMA in the Draft SEIS - accepting the licensee's minimization of consequences that make the cost of adding a filter to the Direct Torus Vent seem unnecessarily high/ not cost effective when it is obvious that the mitigation of installing the filter could indeed serve to protect public health and safety. I repeat, unfiltered venting has been judged unsafe by all regulatory agencies outside the United States.

Generic Environmental Impact Statement for License Renewal of Nuclear Plants Draft Report for Comment– NUREG 1437 supplement 29: Appendix G: Table G-4 SAMA Cost/Benefit Screening Analysis for PNPS:

cost benefit now stated at $1,220,000

Clearly, the Applicant's first analysis wasn't sound and it is equally clear that the second analysis is not sound – both are perfect examples of how a poorly performed SAMA analysis can lead to an erroneous conclusion. The Applicant used incomplete and incorrect input parameters into the MACCS2 code to downplay the health and economic costs of severe accidents and used the Probabilistic Safety Analysis model to limit the benefits of mitigation. It ignored the true off-site radiological and economic consequences of a severe accident at Pilgrim. The Applicant did not fully consider the alternatives that could mitigate consequences including atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts. The regulations require a broad assessment of mitigation not an easy dismissal by "probability weighting." Probabilistic modeling can underestimate the true consequences of a severe accident. The user has total control over the results that will be produced using the MACCS2 Code. Neither the MACCS2 model used to analyze consequence nor the input data provided by the applicant provide an accurate assessment of the off-site dose and economic consequences of a severe accident. Entergy's input to the code, including meteorological data, demographics, emergency response, and regional economic data, were incomplete, incorrect or out of date. These inaccuracies result in incorrect conclusions drawn about accident consequences and minimize the likely risks of a severe accident. The Applicant has drastically under counted the costs of a severe accident, and this could have led it to erroneously reject mitigation alternatives. Further analysis is called for.

It would make no sense for the NRC to require Severe Accident Mitigation Analysis if an Applicant could simply multiply all consequences of an accident by extremely low probability and thus reject all possible mitigation as too costly. The NRC ruled that all testimony on accident consequences must also contain a discussion of accident probabilities. The Commission should not ignore the potential consequences of severe-consequence accidents by always multiplying those consequences by low probability values."

I challenge the Applicant's subsequent second try. It is just as likely the revised number is no more accurate and a gross under estimation. I have not changed my conclusion that the licensee is significantly minimizing the consequences of unfiltered venting. The NRC treats most environmental issues as generic so how then is it fair or reasonable to say $3 million at one reactor is cost effective and here it is not? Look at the value of just the Town of Duxbury's 19,082 acres of aquaculture/shell fishing annual multi million dollar industries; 870.46 acres of Cranberry Bogs yielding $1 million annually, homes, property and businesses assessed at $3,668,240,970. The $3 million cost is a small price to better protect public health and safety

From: Millie Morrison [millie.morrison@verizon.net] PNPS-D-DD
Sent: Tuesday, February 27, 2007 9:53 PM
To: PilgrimEIS@nrc.gov
Subject: relicensing of PNPS

1. As a member of the Duxbury,MA Nuclear Advisory Committee I have several concerns about the relicensing of the Pilgrim Nuclear Power Station. I believe the most important job of the NRC is to protect the health and safety of the public and the environment. I believe the NRC's EIS minimizes the health risks of radiation releases from the plant. I feel the 1990 DPH publication mischaracterized the study of increased cancer incidences in South Eastern Massachusetts. In addition, I believe that our marine aquatic resources are being compromised by the intake design of the PNPS.

I have read Chairman Dale Klein's recommendation that future nuclear power plants should include design improvements to better protect against attack by large aircraft. Don't the citizens in our area deserve as much? Today the PNPS is packed with spent fuel rods in a structure designed before the 9/11 attacks, with off site storage of spent fuel highly unlikely. While the concrete walls may withstand an attack, can you assure us that the ceiling is impenetrable?

In California it has been ruled that the threat of terrorist attack should be considered by the NRC in deciding on the licensing of nuclear facilities. Why don't the citizens of Massachusetts deserve the same consideration and protection? I agree with the Union of Concerned Scientists in their stand on the realistic revision of security regulations.

I hope you will thoughtfully consider the arguments I have presented and take the bold step of refusing to reticence the Pilgrim Nuclear Power Station.

Sincerely,

Millie Morrison

PNPS-D-EE

Pilgrim Watch

148 Washington St., Duxbury MA 02332

Tel 781-934-0389 Fax 781-934-5579 E-Mail Mary.Lampert@comcast.net

February 5, 2007

DRAFT SUPPLEMENTAL ENVIRONMENTAL REVIEW (SEIS) –
Draft NUREG-1437, Supplement 29 –Summary Comments

OVERVIEW

The NRC staff concludes that cumulative impacts of PNPS license renewal would be SMALL for most potentially affected resources, with the exception of the local winter flounder population and Jones River population of rainbow smelt, for which impacts would be MODERATE (p.9-5).

NRC's conclusion results from ignoring new and significant information pertaining to Pilgrim that has occurred since NUREG – 1437 [The Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants] was written in 1996; and incorrectly assuming current NRC regulations are being met by the licensee and that the regulations, themselves, reflect current realities and are protective of public health and safety.

CONTENTS

I. RADIOLOGICAL IMPACTS ON HUMAN HEALTH [4.3; 4.7; 4.8]

II. ENVIRONMENTAL IMPACTS OF THE URANIUM FUEL CYCLE AND SOLID WASTE [6.0] – spent fuel, so-called low level waste and transportation of radioactive waste,

III. ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS [5.0]

IV. ENVIROMENTAL IMPACTS OF DECOMMISSIONING [7.0]

V. MARINE AQUATIC RESOURCES [2.2.5; 4.0]

I. RADIOLOGICAL IMPACTS ON HUMAN HEALTH

"Small" impact, no new and significant information

Draft SEIS: Health 2.27 (radiological impacts – monitoring & dose assessment); 4.3 (normal operations); 4.7 (during renewal term); 4.8.3 (cumulative on health); 5.0 (impacts accidents); 6.0 (decommissioning); comments A-28

Summary

NRC staff incorrectly concurs with Entergy that there is no new and significant information pertaining to Pilgrim and that the health impact is, and will continue to be, small by:

(1) Mischaracterizing the National Academy of Science (NAS) Biological Effects of Ionizing Radiation (BEIR VII) report.

NRC staff and Entergy deny that BEIR VII provides new and significant information by misstating what BEIR VII actually said. Examples:

- NRC focused only on cancer mortality, and ignored BEIR VII's findings on cancer incidence which the report found 1/3 higher than previously thought.

· NRC ignored: BEIR VII's findings of the differential effect of radiation exposure on women and young children. For example: In 1990, the NAS estimated that the risks of dying from cancer due to exposure to radiation were about five percent higher for women than for men. In BEIR VII, the cancer mortality risks for females are 37.5 percent higher. The risks for all solid tumors, like lung, breast, and kidney, liver, and other solid tumors added together are almost 50 percent greater for women than men.

· BEIR VII increased the impact from allowable radiation standards on workers (5 rem/yr) from their previous study. NRC's own risk figures say 1 in 8 workers so exposed would die from

cancer induced by that dose. BEIR VII says ~twice that number -- ~1 in 4 -- would get a cancer, fatal or one they survive, from that exposure.

· BEIR VII discusses negative health effects in addition to cancer- increase risk of heart disease and stroke, though it did not give specific risk estimates.

(2) NRC staff cite cherry-picked health studies done by the nuclear industry's equivalent of "tobacco scientists" that supposedly, though mistakenly, demonstrate that there is no correlation between radiation dose from nuclear facilities and cancer to the general public and ignoring those studies that do show a correlation.

One Example:

- NRC highlights the University of Pittsburg study that "found" no link between the radiation released during TMI's 1979 accident and cancer deaths among nearby residents.

  The Draft SEIS failed to mention a later study by Dr. Steven Wing, associate professor of epidemiology at the UNC-CH School of Public Health, who led a study of cancer cases within 10 miles of the facility from 1975 to 1985. He and colleagues conclude that following the March 28, 1979 accident, lung cancer and leukemia rates were two to 10 times higher downwind of the Three Mile Island (TMI) reactor than upwind.

For a comprehensive review of new and significant studies that indeed show a correlation between radiation dose from nuclear facilities and negative health effects in the general public, see: BEIR VII and Clark University's Marsh Institute, *Health Risks of Ionizing Radiation –an overview of epidemiology studies*, March 2006.
http://www.clarku.edu/departments/marsh/projects/community/EpiOverviewFinal.pdf

(3) Mischaracterizing Massachusetts Department of Public Health's Southeastern Massachusetts Health Study (SMHS): SMHS is a case control study that found a four-fold increase in adult leukemia. Boston Edison (BECO), the owner of Pilgrim at the time, cut a political deal which allowed BECO, the implicated industry, to appoint a second peer review

panel to re-review the study and write a report. The NRC Staff in the Draft SEIS misinterpret the second re-review peer group and state in the Draft SEIS,

> ...with regard to the SMHS, NRC has considered the relevant information in these citations and concludes that the peer reviews and even the authors now agree that the SMHS does not demonstrate a causal relationship between the PNPS effluents and the potential effect of excess cancers in the areas around the site.

a) The authors of the study [Dr. Robert S. Knorr, Director, Environmental Epidemiology Program Center for Environmental Health, MDPH] never spoke to the NRC staff on this issue[1]; additionally Suzanne Condon, Associate Commissioner MDPH stated that, "the only conversations she ever had about our study and/or cancer rates with the NRC always emphasized that we continue to stand by our original conclusions."

The author of the SMHS study continued by pointing out that the re-review panel concluded:

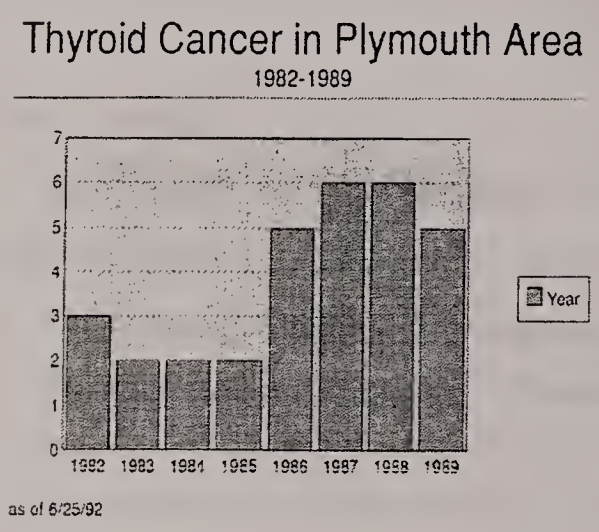
> The [original SMHS] study team adhered to generally accepted epidemiological principles.." and "the findings of the SMHS cannot be readily dismissed on the basis of methodological errors or proven biases...;" and
>
> The association found between leukemia and proximity to the Pilgrim nuclear facility was unexpectedly strong and, this raised concern regarding the biologic plausibility of the study.
>
> ...because the study results could not be dismissed, further study may be warranted, including expanding case finding and including children.

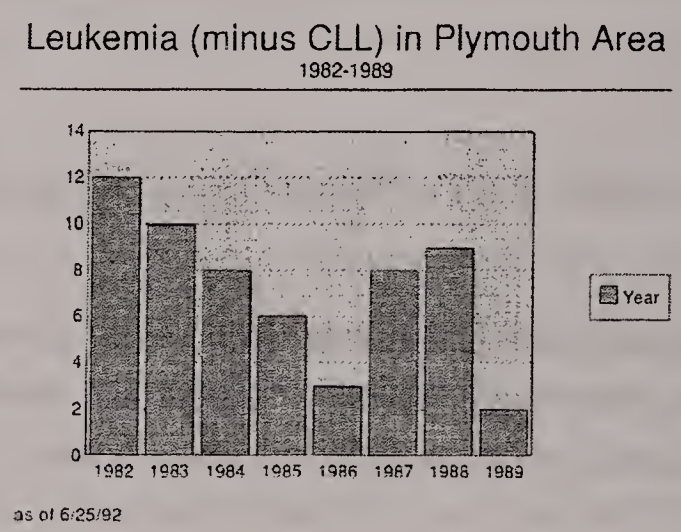
The NRC's statement that the MDPH indicated that the findings demonstrated cause and effect is incorrect. The MDPH report specifically states that it is not possible to reach definitive conclusions regarding cause and effect but that the results should be followed up to clarify their public health implications. This conclusion is consistent with that stated by the peer

[1] Source: Personal communication with Dr. Robert Knorr, January 17, 2007 via email

reviewers. While the findings of the study may not support a causal relationship, the NRC arguments in their Supplemental Impact Statement ignore the principal MDPH and peer review conclusions that the findings cannot be dismissed.

(4) The NRC staff ignored other new and significant information - site specific studies of radiation health effects in communities likely-to-be affected by Pilgrim; and the changed demographics of the population immediately surrounding the plant, including its age and geographical distribution - making this population more susceptible to more radiation-linked damage than was contemplated when the plant was licensed.





The Massachusetts Cancer Registry also shows, for the years 1998-2002, a continuing increase of leukemia and thyroid cancer in the towns around PNPS. Specifically, there were 83 cases of leukemia reported to the Massachusetts Cancer Registry (MCR), where 72.9 would have been expected based on statewide rates. This results in a Standardized Incidence Ratio (SIR) of 114 (95% conf. int. = 91-143). In addition, there was excess thyroid cancer in these same towns for the same time period. The thyroid cancer SIR was 122 (95% conf. int. = 96-155). In other words, leukemia was 14% elevated over the statewide rate and thyroid cancer was 22% elevated. Neither of these calculations were statistically significantly elevated by the usual convention (P<.05), but there were more cases than expected nevertheless. This means

there is a continuing excess of these two radiation-related cancers in the population, as there was in the 1980s.

Prostate cancer and multiple myeloma, both radiation-linked diseases, are also elevated and statistically significant for the years 1998-2002 in the seven towns most likely to be impacted near Pilgrim (Carver, Duxbury, Kingston, Marshfield, Pembroke, Plymouth, and Plympton). The seven towns listed are those that a meteorological analysis done by Dr. Spengler and Dr. Keeler for Massachusetts Department of Public Health indicated are most impacted by the sea breeze effect.[2]

These new and significant site-specific studies show that the area is a damaged, sensitive population, and consequently less able to tolerate additional assaults.

Demographics: Communities south of Boston will grow 13% and Plymouth is expected to add the most, about 10,000 residents – a population jump of over 20%. By 2030, 1 in 3 people will be over the age of 55, compared to 1 in 5 now. This is relevant to any analysis of health impacts, as new and significant studies have shown an increased sensitivity to low levels of ionizing radiation in older populations.[3]

(5) Standards, allowable releases: NRC's misrepresents the impact of radiation released from Pilgrim by inappropriately using the "standard man' or "reference man" as its basis for calculating risk and health effects. The so-called standard man is fully matured and healthy. BEIR VII states that risks for females and children are much larger than for a 'standard man.' That would cause the calculations for risks using the NRC's 'standard man' to be much lower than actually experienced by a population at risk unless the population at risk is composed totally of 'standard men.' The population of Plymouth County has 51.3% women and many

[2] Feasibility of Exposure Assessment for The Pilgrim Nuclear Power Plant Dr. J.D. Spengler and Dr. G.J. Keeler, May 12, 1988

[3] *Greater Sensitivity to Ionizing Radiation at Older Age: follow-up of workers at Oak Ridge National Laboratory through 1990.* Richardson, D.B. and Wing, S. Int. J. Epidemiol., 1999, 28:428-436; *the Hanford Data: Issues of Age at Exposure and Dose.* Stewart, A.M., Kneale, G.W., PSR Quarterly Vol. 3, No.3 (Sept. 1993) 3:101-111; and *Leukaemia near nuclear power plant in Massachusetts*, Richard Clapp, Sidney Cobb, C K Chan, Bailus Walker, 924 , Lancet, 1987.

children [7% under 5; 26% under 18] who are not correctly considered in the risk calculations (US Census data, 2000). Additionally, we know from new research that radiation affects the most vulnerable – the sick (discussed above), the young[4] and the old.[5] This makes intuitive sense – for example, the older we get, the more vulnerable we become and this is borne out by research.[6] By 2030, (1) in (3) people will be over the age of 55, compared to 1 in 5 now.

(6) NRC staff overstates background radiation and incorrectly assume that Pilgrim's monitoring reports and dose calculation models are reliable and accurate.

· Background radiation: The NRC staff attempts to minimize the impact of the reported amount of radiation released from Pilgrim by stating it is but a small per-cent of background radiation. They incorrectly claim that, "The average dose of approximately 360 mrem/yr from natural background and medical sources of radiation (NRC 2005)." That number is a national average - not applicable here. The soil in Plymouth and surrounding towns is largely sand containing very little uranium, thorium and radium. We are not Denver, Colorado, for example.

· Pilgrim's monitoring reports and dose calculation models are neither reliable nor accurate. Example: dose calculation models assume that a radioactive plume will move in a straight line when, in fact, wind in our coastal communities is highly variable affected by the sea breeze effect, topography, and buildings. Wind direction is measured by the meteorological tower on the reactor building. It only tells where the wind in blowing on site not what happens to it offsite. There are no real-time weather and radiation monitors appropriately placed in

[4] National Academies of Science, Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2, 2005, National Academies Press

[5] George Kneale and Alice Stewart, "Factors Affecting Recognition of Cancer Risk of Nuclear Workers" Occupational and Environmental Medicine 52 (1995):515-23; Steve Wing et al.," Mortality among Workers at Oak Ridge National Laboratory," Journal of American Medical Association 265 np, 11 (20 March 1991): 1437-38.

[6] We note that the A-bomb studies concluded that radiation affects the young and healthy more than the old, since they found more cancer in the young. But this would make radiation unlike almost any other cause of death. The A-Bomb Survivor Study was begun in 1950, five years after the bombing; many of the sick, weak, young children and elderly died off from the devastating lifestyle consequences of the bomb. The survivors were actually a selected healthy survivor population; the survivors are not a representative population.

surrounding communities to measure alpha, beta and gamma radiation. Environmental sampling for radiation in the environment is limited; and the samples are analyzed and reports prepared by Entergy's own laboratory.

· Testing Silver Lake – it provides drinking water to Brockton. There is no indication that the lake has been tested for radionuclides; and Brockton adds an environmental justice dimension, due to its economic profile.[7]

(7) Bio-Accumulation of Radionuclides in the Environment from 1972-2032 –ignored

The effects of radiation exposure are cumulative; this is ignored by NRC staff in the Draft. Some types of nuclear power plant emissions stay radioactive for a long time and, because they can enter biological food chains, those materials can accumulate in the environment and adversely affect public health. "If radioactive emissions persist for years, decades or even centuries within the environment, then even modest reductions in annual discharges may not be sufficient to prevent an environmental build up of those materials over time." *Estimates of Environmental Accumulations of radioactivity Resulting from Routine Operation of New England Nuclear Power Plants (1973-84),* Dr. Richard W. England,, Mr. Eric Mitchell, p.4, A Report of the Nuclear Emission Research Project, Whittemore School of Business and Economics, University of New Hampshire, Durham, N.H., August 1987.

It is known for example that the following radionuclides have been released from Pilgrim into neighboring communities: plutonium 239 (half life 24,400 years); neptunium 236 or 237 (half life ranging from 120,000years -2.1 million years); cesium 137 (half life 30.2 years); strontium 90 (half life 28.5 years); tritium (half life 12.3 years), and xenon (half life 9.17 hours). Xenon transforms after its emission into cesium 135, which persists almost indefinitely in the environment. Examples of previous releases have been reported in the Annual Radiological Environmental Monitoring Program Reports [REMP].[8]

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[7] Point brought forward at Hearing by Ms Pine DuBois, Kingston

[8] For example, in June 1982, Pilgrim blew its filters and released contaminated resin material off site into surrounding communities. The licensee's own Radiological Environmental Monitoring Program Report for 1982 showed for example: Cesium -137, (1,000,000) times higher than expected in milk tested at the indicator sampling farm 12 miles west of the reactor and no elevation at the control station, 22 miles away; Cesium-137 again (1,000,000) higher in vegetation samples from indicator farms .7 miles and 1.5 miles from the reactor. Plutonium 239/240: Radiological Environmental Reports(REMP) 1998, Plutonium found in indictor samples and Duxbury Beach; REMP 1999, Plutonium found Duxbury Beach; REMP 2000, Plutonium in indicator samples and Duxbury Beach, later excused by stating contamination must have resulted from a dirty beaker; REMP 2001 Plutonium Duxbury Beach; REMP 2003 forward stopped testing for Plutonium on Duxbury Beach.

These releases include substances that will remain active in the local environment for the foreseeable future and should have been taken into account when actual on-going doses to the public are evaluated.

(8) NRC staff fail to include new and significant information on health effects in Section 5.0 Environmental Impacts of Postulated Accidents. Examples:

· NRC staff do not mention, the new and significant site specific report by the Massachusetts AGO, *Report to The Massachusetts Attorney General On The Potential Consequences Of A Spent Fuel Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant,* Jan Beyea, PhD., May 25, *in Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket No. 50-293, May 26, 2006* 2006.

The report estimated the costs and latent cancers of Cesium-137 releases from Pilgrim's spent fuel as follows:

	10% release C-137	100% release C-137
Cost (billions)	$105-$175 billion	$342-$488 Billion
Latent Cancers	8,000	24,000

· NRC staff failed to mention the new and significant information on potential health consequences from a spent fuel pool accident. Conclusions the National Academy of Sciences - *Safety and Security of Commercial Spent Fuel Storage*," National Research Council of the National Academy of Sciences, Public Version, April, 2005 Finding 3B – "... a terrorist attack that partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and the release of large quantities of radioactive materials to the environment. Details are provided in the committee's classified report" NAS, p. 6; "Such (zirconium cladding) fires would create thermal plumes that could potentially transport radioactive aerosols hundreds of miles downwind under appropriate atmospheric conditions". NAS, p.50; and "The excess cancer estimates ...to between 2,000 and 6,000 cancer deaths" NAS, p. 45. The NAS report

pertains directly to Pilgrim because it was among the reactors pointed out to be more susceptible to damage due to its design placing the pool in the "attic" – vulnerable from three sides.

II. ENVIRONMENTAL IMPACTS OF THE URANIUM FUEL CYCLE AND SOLID WASTE [6.0] – spent fuel, so-called low level waste and transportation of radioactive waste

"Small" impact, no new and significant information

Draft SEIS states that Entergy and the NRC staff are not aware of any new and significant issues – they therefore conclude that there will be no impacts related to these issues beyond those discussed in the GEIS – impacts judged to be "small." However new and significant information abounds.

A. Spent Fuel – high level radioactive waste
"Small" impact, no new and significant information

The Draft SEIS's findings ignore new and significant information regarding the dangers of spent fuel storage. For example, staff ignored:

- The National Academy of Sciences Report *Safety and Security of Commercial Spent Nuclear Fuel Storage Public Report, April 2005*;
- Dr. Jan Beyea's report for the Massachusetts Attorney General's Motion to Intervene in Pilgrim's Re-Licensing Application, May 2006;
- Pilgrim Watch's Motion to Intervene in Pilgrim's Re-Licensing Application, Contention 4, May 2006;
- The Massachusetts Attorney General's Petition for Rulemaking, August 2006 that calls, for example, for NRC to consider new and significant information showing that the NRC's characterization of the environmental impacts of spent fuel storage as insignificant in the 1996 Generic Environmental Impact Statement for Renewal of Nuclear Plant Licenses ("License Renewal GEIS") is incorrect; and
- The fact that NRC's Waste Confidence Rule is fantasy or wishful thinking- there is no likelihood that the spent fuel at Pilgrim will leave Plymouth anytime soon or ever.

More basically – there is no storage plan for spent fuel presented in the Application or any subsequent study by the NRC review staff so that the onsite storage plan can be analyzed; therefore there is no basis for the NRC staff to claim that the environmental impact of storing half-again as much until 2032 presents no environmental risk.

B. Low-Level Radioactive Waste
"Small" impact, no new and significant information

The NRC staff incorrectly concluded that there was no new and significant information and therefore there would be no impacts of low level waste storage and disposal associated with the renewal term. Further the staff mistakenly agrees with the GEIS that, "...The maximum additional on-site land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small." And, "...the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirement."

The NRC staff did not bother to look at new and significant information pertinent to this site and must be required to do so before finalizing the SEIS.

- Pilgrim is a very large generator of LLRW. In 2003, for example, Pilgrim shipped 59,089 cubic feet, containing 1,210.000 curies; and stored 4,178.3 cubic feet containing 4,620.000 curies.[9]
  Barnwell S.C. announced that it will close to Massachusetts generators June 20, 2008.
- Massachusetts is not a member of any compact; in order to join Massachusetts would have to agree to be a host community; Massachusetts indicated clearly in the mid 1990's that it would not be a host community.
- Texas <u>may</u> open, no guarantees, and if it does open there is no assurance that non-Texas Compact members will be able to send their waste there and if allowed whether fees would be prohibitive.
- No sites have been developed anywhere in the country despite millions of dollars spent on failed attempts.
- Terrorism or acts of malice were not considered a threat in 1972. Not so, post 9/11 - nuclear facilities/materials are known to be attractive targets.
- Pilgrim is located on Cape Cod Bay and the property slopes towards the Bay so that any

[9] 2003 MASSACHUSETTS LOW - LEVEL RADIOACTIVE WASTE SURVEY REPORT, Massachusetts Department of Health Radiation Control Program, October 2005

leaking contaminants from waste storage facilities will flow towards and eventually into the Bay. There are no monitoring wells lining the shoreline. Further the coast is a salt corrosive environment and its effect on concrete and waste packaging must be analyzed.

- The undisputed recognition of global warming is new and brings with it increased severity of coastal storms, erosion, and increased sea levels. Hence this must be factored into on-site waste storage options.

Storage of LLRW is important for our community's health and safety because there is nothing low level about the waste. Waste is characterized "high" or "low" depending on where it comes from, how it is generated, not according to its' toxicity and longevity. Waste containers and forms will not last as long as some waste remains hazardous. Therefore, we want to know what Entergy's plans are for storing LLRW; monitoring the releases; and what are the "acceptable" public radiation exposures and health risks.

We deserve to know what the LLRW storage plans are before the application is decided; so that the re-licensing decision does not prejudge any LLRW storage decision.

C. Transportation The Draft SEIS incorrectly concludes that there was no new and significant information identified so therefore there will be no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

Comment

Let's assume, as the Draft does, that Yucca will open -some day off in the future. The Draft ignores new and significant information about transportation hazards and shipping cask integrity. In fact, they never present the transportation plan for getting the tons of spent fuel out of here.

As part of the current plan, DOE proposes up to 24 barges carrying giant high-level radioactive waste containers onto Cape Cod Bay, Massachusetts Bay and Boston Harbor bringing hundreds of tons of dangerous poisons to densely populated Boston to be transferred from there by rail.

Will the public go along? Accidents happen and each barge sized container would hold up to 200 times the long-lasting radioactivity given by the Hiroshima atomic bomb. Leakage of even a fraction could mean catastrophe. How do you ever recover it?

NRC design criteria for waste transport containers are woefully inadequate. Rather than full scale physical testing, scale model tests and computer simulations are all that is required. The underwater immersion design criteria test examines the integrity of a slightly damaged container submerged under 3 feet of water for 8 hours. An undamaged cask is paper-tested for 1 hour submersion under 656 feet of water. If a cask were accidentally immersed under water or sunk by terrorists, is it reasonable to assume that the cask was only slightly damaged, or not damaged at all? Barge casks weigh well over 100 tons (up to 140 tons), how can NRC assume that they will be recovered underwater somewhere en route to Boston within 1 hour, or even up to 8 hours? Special cranes capable of lifting such a heavy load would have to be located, brought in and set up after finding where it went, perhaps in inclement weather.

III. ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS [5.0]

5.1.2 Severe Accidents

"Small" impact, no new and significant information

There is so much that is so blatantly wrong with NRC's analysis that it is nearly impossible to know where to begin. We will focus on some illustrative highlights.

1. Risk of Sabotage Deemed "Small"

Draft SEIS concluded that, "Additionally the NRC regulatory requirements under 10 CFR Part 73 provides reasonable assurance that the risk of sabotage is small."

NRC did not consider new and significant information specific to this site; no reasonable person would agree that NRC regulatory requirements "provide reasonable assurance that the risk of sabotage is small."

<u>Massachusetts listed among top 5 terrorist targets</u>

In, Arab-*American to become first Massachusetts homeland security chief,* David Weber, Associated Press, January 21, 2007 states,

The federal government lists Massachusetts -- where two of the planes involved in the 9-11 attacks were launched from Logan International Airport -- among the five states most likely to be involved in attacks.

Ninth Circuit Court - San Luis Obispo Mothers for Peace v. Nuclear Regulatory Commission, June 21, 2006 contradicts NRC Staff. The court dealt with the question of whether the NRC must address impacts of terrorist attacks in licensing decisions under National Environmental Policy Act - the court concluded that it did. Although technically the court's decision does not have to be applied here, practically it does. The NRC deals with most issues generically. Therefore how can NRC turn around and say it applies in California but not in Massachusetts?

The Court found that: the risk of a terrorist attack is not too speculative for consideration under NEPA; the numeric probability of a terrorist attack need not be precisely quantifiable in order for its potential environmental impacts to be considered; the NRC erred by characterizing Petitioners' request as a demand for a "worst-case" analysis when Petitioners did not ask the NRC to engage in conjecture on the worst-case outcome, but instead sought an analysis of the likely range of environmental impacts if an attack occurred;"[t]here is no support for the use of security concerns as an excuse from NEPA's requirements.

The US Supreme Court, January 16, 2007, refused to review the Ninth Circuit's ruling that, in order to comply with the National Environmental Policy Act (NEPA), the NRC must consider the environmental impacts of terrorist attacks before it licenses the new waste storage facility.

The NRC and industry claim that they have invested huge sums to increase security and put in place extra measures. It is not logical for the NRC to consider the threat of terrorist attacks extremely serious outside the NEPA context but only speculative and theoretical within it.

Bottom line –the ruling stated that agencies must conduct at least an environmental assessment for any government-approved project. If that review reveals the likelihood of a significant impact, the agency then must prepare a more thorough environmental impact statement. Re-licensing Pilgrim is a government -approved project; hence the SEIS logically should consider its impact – the draft did not.

Risk of sabotage far from "small" – CRAC II Report; NAS Report; MA AGO Motion

The President of the United States, Congress, special commissions all agree that the risk of sabotage to our country is considerable and increasing. Nuclear reactors are prime targets because of the catastrophic consequences a successful attack would bring. Pilgrim is an especially attractive target because of its location in "America's Hometown" – a symbolic target - Plymouth is known around the world. Pilgrim is vulnerable to an attack by the air [even a small explosive laden helicopter could cause a disaster by targeting the switch-yard, control room, intake, not to mention the densely packed spent fuel pool]; sea [a few buoys marking the no-enter zone, floating "No Trespassing" signs, provide no real deterrence; and land [onsite guards depend on off site forces, it is highly unlikely for them to arrive in sufficient time considering that OSRE mock attacks are usually lost in three minutes]; and there are simply not enough guards, trained and equipped, to meet the number of attackers and type of equipment involved in 9/11.

Examples - new and significant information showing risk far from small:

A. Core Melt – Calculation of Reactor Accident Consequences U.S. Nuclear Power Plants (CRAC-2), Sandia National Laboratory, 1982

A core melt at Pilgrim NPS, calculated by the federal government, would result in a 20 miles peak 1st year fatal radius; a 65 miles peak 1st year injury radius; and 23,000 peak cancer deaths.[10]

[10] Calculation of Reactor Accident Consequences U.S. Nuclear Power Plants (CRAC-2), Sandia National Laboratory, 1982. "Peak" refers to the highest calculated values – it does not mean worst case scenario. This is due to uncertainties in the meteorological modeling acknowledged by Sandia. The model only considered one year's worth of data and does not model for precipitation beyond a 30-mile radius. This is significant because the highest consequence is predicted to occur when a radioactive plume encounters rain over densely populated area. Peak Early Fatalities are deaths that result within the first year. Peak Early Injuries are radiation-induced injuries occurring in the first year that require hospitalization of other medical attention – such as sterility, thyroid nodules, vomiting and cataracts. Peak Cancer Deaths are predicted to occur over a lifetime. However, this is not the case with leukemia which is assumed to have occurred within the first 30 years following the accident.

And new information available since the GEIS is a later analysis of the CRAC study by Dr. Edward Lyman showing that these estimates are conservative ["*Chernobyl on the Hudson? - The Health and Economic Impacts of a Terrorist Attack at Indian Point Power Plant*," Dr. Edwin Lyman, September 2004]. In the report he concluded,

The federal study, CRAC II:

- used census data from 1970;
- assumed entire 10-mile EPZ would be evacuated within at most six hours after issuance order;
- assumed aggressive medical treatment for all victims of acute radiation exposure in developing numbers for early fatalities;
- used a now obsolete correlation between radiation dose and cancer risk that underestimated the risk by a factor of 4 relative to current models; and current models need to be recalculated again based on the National Academy's BEIR VII Report (June 2005) that reconfirmed that there is no safe level of radiation, risks are greater than previously thought and health risks other than cancer must be considered –such as heart disease and birth defects;
- sampled only 100 weather sequences out of over eight thousand (an entire year's worth), a method that underestimates the peak value over the course of a year by 30%

B. Spent Fuel Pool Accident

1) National Academy of Sciences[11]

> "Finding 2A: Spent fuel storage facilities cannot be dismissed as targets for such attacks because it is not possible to predict the behavior and motivations of terrorists, and because of the attractiveness of spent fuel as a terrorist target given the well known public dread of radiation...The committee judges that attacks by knowledgeable terrorists with access to appropriate technical means are possible." NAS, p.4

> "Terrorists view nuclear power plant facilities as desirable targets because of the large inventories of radionuclides they contain. The committee believes that knowledgeable

[11] Safety and Security of Commercial Spent Nuclear Fuel Storage Public Report, National Academy of Sciences, April 2005

terrorists might choose to attack spent fuel pools because: (1) at U.S. commercial nuclear power plants, these pools are less well protected structurally than reactor cores; (2) they typically contain inventories of medium – and long-lived radionuclides that are several times greater than those in individual reactor cores." NAS, p.36

"A loss-of-pool-coolant event resulting from damage or collapse of the pool could have severe consequences. Severe damage of the pool wall could potentially result from several types of terrorist attacks, for instance: (1) Attacks with large civilian aircraft; (2) Attacks with high-energy weapon; Attacks with explosive charges." NAS, p.49

"Finding 3B –... a terrorist attack that partially or completely drained a spent fuel pool could lead to a propagating zirconium cladding fire and the release of large quantities of radioactive materials to the environment. Details are provided in the committee's classified report." NAS, p.6

"Such (zirconium cladding) fires would create thermal plumes that could potentially transport radioactive aerosols hundreds of miles downwind under appropriate atmospheric conditions." NAS, p.50

"The excess cancer estimates ...to between 2,000 and 6,000 cancer deaths"[i] p.45

2) An analysis of spent fuel pool accident at Pilgrim was performed by Dr. Jan Beyea for the Massachusetts Attorney General's Motion to Intervene in Pilgrim's re-licensing application. [The Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene With respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plants Operating License and Petition for Backfit Order Requiring New Design features to Protect Against Spent Fuel Pool Accidents, Docket No. 50-293, May 26, 2006 includes a Report to The Massachusetts Attorney General On The Potential Consequences Of A Spent Fuel Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant, Jan Beyea, PhD., May 25, 2006.]

Dr. Jan Beyea's estimated the consequences following the release of Cesium-137 from Pilgrim's spent-fuel pool. We recognize that these are conservative estimates because: (1) he only considers Cesium-137, other radionuclides would be released; and (2) he only looks at latent cancers and not other radiation-linked diseases, reproductive disorders and birth defects.

	10% release C-137	100% release C-137
Cost (billions)	$105-$175 billion	$342-$488 Billion
Latent Cancers	8,000	24,000

3) Operating with faulty fuel cladding was not taken into account, either - both the probability and consequences of postulated accidents may be increased when nuclear plants operate with pre-existing fuel cladding failures. Degraded fuel is an on going issue for the industry. NRC Commissioner Merrifield has admitted nearly 1/3 reactors now have failed fuel, and the trend is increasing, not decreasing. *Briefing on Nuclear Fuel Performance,* Transcript, p.4, (February 24, 2005), http://www.nrc.gov.

3. 5.2.6 Conclusion – NRC Staff mistakenly claim Applicant's SAMA Analysis "sound"

1) It was far from "sound" in that it ignored a spent fuel pool accident at Pilgrim. The NRC staff excused this by misinterpreting prior cases and going to the wrong section of the GEIS.

The NRC in *Turkey Point* concluded that the GEIS exempts spent fuel pools. They did so by referring to section 6 of the GEIS[12], which deals with "The Uranium Fuel Cycle and Solid Waste Management" under *normal operations*, rather than going to section 5 of the GEIS, which deals with "Environmental Impacts of Postulated Accidents." Section 5 includes definitions of "severe" and "accident" and does not limit these to reactor accidents in any way.[13]

Section 5.2.1 of NUREG 1437 "General Characteristics of Accidents" begins its discussion of design basis and severe accidents with a definition of these terms. "The term '***accident***' refers to any unintentional event outside the normal plant operational envelope that results in a release or the potential for release of radioactive materials into the environment . . . '***severe***' . . .[includes] those involving multiple failures of equipment or function and, therefore, whose likelihood is generally lower than design basis accidents but where consequences may be higher . . ."

It is their potential for "releases substantially in excess of permissible limits" that makes it necessary to consider them in SAMAs. This entire SAMA section focuses on potential *consequences* to determine whether a potential accident is severe or not – not whether the source is the reactor core or elsewhere at the plant.

[12] Section 6 in NUREG – 1437, whose conclusions are carried over into Appendix B to Subpart A of Part 51.
[13] See discussion under III.A.

2) "The staff reviewed Entergy's analysis and concluded that the methods used and implementation of those methods was sound." And "the costs of SAMAs evaluated would be higher than the associated benefits. 5.2.5. The NRC staff is wrong to accept Entergy's SAMA analysis in the application - see Pilgrim Watch's Motion to Intervene, Contention 3.

Criticism:
The Applicant's Environmental Report inadequately accounts for off-site health exposure and economic costs in its SAMA analysis of severe accidents. By using probabilistic modeling and incorrectly inputting certain parameters into the modeling software [such as meteorology, demographic data, economic data, emergency response data], Entergy has downplayed the consequences of a severe accident at Pilgrim and this has caused it to draw incorrect conclusions about the costs versus benefits of possible mitigation alternatives.

Examples:
Economic data - Nowhere in the assessment of the economic costs of a severe accident does the model account for the loss of economic activity in Plymouth County. The valuations include only the assessed value of the property, ignoring business value. The fact that the building is an on-going business with inventory, equipment, and income generation capability is not taken into account. Tourism is ignored which is mystifying because the staff looked into and mentions historic and archaeological resources as a variable in their alternative analysis, section 8, and description of the site (section 2.2.9).

Evacuation Delay time
Entergy assumes that the longest likely delay before residents begin to evacuate is 2 hours. This assumption is incorrect for the simple reason that notice of the evacuation could take longer than 2 hours to reach people. The sirens only can be heard outside, if an accident occurs when residents are inside, during the night for instance, they are unlikely to be notified within 2 hours. The peak population in the EPZ approximates 100,000. How is it conceivably possible to spread the word if the sirens are down over approximately 150 square miles when the public is engaged in a variety of activities? What about those who can not hear the sirens inside?

Evacuation Speed

Entergy assumes the evacuation speed will be from 3 hours 35 minutes to 6 hours 30 minutes However, to arrive at this number, the applicant falsely assumes that: the public is out of danger once they cross the 10 mile boundary but in a severe accident harmful levels of radiation (and thus evacuation) will extend beyond 10 miles; they assume no one beyond 10 miles will evacuate, leaving roads clear when we know the "shadow evacuation" will occur and a "cork will effectively be placed in the bottle" trapping those near the core; and they assume transportation providers from well outside the zone will come and whisk folks away within this small frame-period. How did the NRC staff buy into this?

5. 2 Severe Accident Mitigation Alternatives

The applicant is required to analyze severe accident mitigation alternatives. The NRC staff concluded in their review of Entergy's analysis that the methods were sound and,

> Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits by a factor of five to account for potential benefits in external events.

Question: Where did "5" come from; what is the rational, none is given; what should it have been? Five is obviously pulled out of the air. It assumes that there is no difference between events caused externally than internally - there is no rational basis for that assumption.

Consequences of NRC rubber-stamping the faulty SAMA Analysis

The faulty SAMA analysis used by Entergy in the Environmental Report, and accepted by NRC in the Draft SEIS, caused it to wrongly dismiss mitigation alternatives such as adding a filter to the Direct Torus Vent.

5.1.1 Design-Basis Accidents

"Small" impact, no new and significant information

"The Commission has determined that impacts of DBAs are small significance for all plants because the plants were designed to successfully withstand these accidents."

NRC staff obviously forgot about the near-miss at Davis Besse NPS – the reactor with a hole in its head. NRC staff incorrectly assumes that: NRC regulations are sufficiently stringent; that regulations are followed by licensees and manufacturers; and that there is sufficient NRC oversight and enforcement action when regulations are not met.

What was not taken into account?

- Spent fuel pool accident can cause/lead to a reactor core accident and vice versa –the interplay was ignored and not analyzed;
- Human error;
- The effects of an aging work force;
- The bathtub curve of aging – trouble occurs in all mechanical components in their early and later stages – Pilgrim will be in the "late stage" from 2012-2032;
- The use of counterfeit and substandard parts;
- The potential leakage of contaminated water offsite;
- The Aging Management Plan failure to adequately monitor for corrosion in the drywell liner;
- Wiring Coating- missing from the list of passive equipment is testing /re-qualifying the EQ rating, although the miles of wiring at Pilgrim is tested with the active components they interconnect -these wires are required to perform under harsh conditions (fire, high temperature, and high moisture). As the wiring ages its ability to still meet the original qualification tests is an interesting, though overlooked, challenge. A good comparison, consider what is happen in the City of Boston. The aging Nstar electric system is failing. How many of those failures are just old wires with rubber coating turned brittle and cracked? The power flows until the manhole explodes. Turing on a pump is like turning on your lights; it does not test the wiring coating, the EQ, only the metal of the wire.
- Engineering Review of Operating Transients: Pilgrim in 1994 had already exceeded the 40-year design standards for 6 kinds of events that put stress on the reactor before license expiration, according to a February 24, 1994 NRC Inspection Report –we are considering adding an additional 20 years.

Transient Description	Design Cycles 40 years	Cycles to-date 21 years	Projected Cycles 40 years
Startup	120	187	368
Power Increase	120	133	264
T/G Trips	40	26	49
Other Scrams	147	134	346
Loss of FW Pumps	10	26	64
SR Valve Blowdown	2	13	23

Replacement parts – difficult, if not impossible, to find from 2012-2032:

Example - The Patriot Ledger Reported, February 25, 2003, *Broken pump shuts Pilgrim power plant* - Engineers traced the pump problem to a defective part in the generator that powers the pump motor, Tarantino said. A 12-inch-wide "slip ring" in the motor and generator had failed... The motor and generator together are about the size of an automobile... Workers are replacing the rotor in the generator... It took until Sunday to get the part because Pilgrim "was built in the 1960s and went on line in 1972," Tarantino said. "In some cases it's becoming difficult to find replacement parts because the technology has changed."

Replacement parts in a global economy can come from anywhere in the world. This presents serious QA issues, not analyzed.

IV. ENVIROMENTAL IMPACTS OF DECOMMISSIONING [7.0]

"Small" impact, no new and significant information

The NRC staff concluded that there are no impacts related to these issues beyond those discussed in the GEIS – the impacts are small and additional mitigation measures are not likely to be sufficiently beneficial to be warranted.

Subsections

1. Waste Management (p.7-3): "Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected." The staff did not identify and new and significant information.

Comment – what's wrong?
What about the generation of half-again as much spent fuel and so-called low-level waste? There is new and significant information indicating that there will NOT be an offsite storage solution anytime soon – not within NRC's stated estimates. The staff simply ignored reality and rests its case on the now outdated Waste Confidence Rule.

2. Air quality (p.7-3): "Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term." The staff did not identify and new and significant information

Comment:
The staff did not provide information about buried wastes on site – where they were located; how deep they were buried; packaging; chemical and radioactive composition of waste.

We know for example that when Pilgrim blew its filters in 1982, there was considerable contamination. During the clean up, waste was buried on the property. Neighbors and passer-bys on Rocky Hill Road observed the operation – NRC and Entergy's staff are aware, too. The public, NRC officials and Entergy staff also are well aware of burials off the Access Road. If the application is approved, decommissioning will not begin until 2032 or later. We assume that the licensee and NRC determined that burying waste on site would not harm the environment based on a definite time frame – a 40 year license. What would happen after 60 years was not considered nor analyzed. It needs to be analyzed to provide reasonable assurance that public health and safety will not be negatively impacted. For example erosion of the top soil will be affected by the passage of time, increasing frequency and severity of coastal storms; and the topography of the site that slants down into Cape Cod Bay. Migration of contaminants underground is currently not monitored. Migration of contaminants from so-called low level waste has happened at other sites - for example, at Barnwell SC, TVA, Hanford and Starmet. Hence there is no reason to believe that the same could not happen here.

3. Water Quality (p. 7-3): "The potential for significant water quality impacts from erosion or spills is no greater when decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts." The staff did not identify any new and significant information. If they had looked they would have

concluded that there are no effective measures currently or in the aging management program to avoid impacts.

The staff ignored the points brought forward by Pilgrim Watch in their Motion to Intervene, May 2006. Contention 1 asserts that the Aging Management program proposed in the Pilgrim application for license renewal is inadequate because (1) it does not provide for adequate inspection of all systems and components that may contain radioactively contaminated water and (2) there is no adequate monitoring to determine if and when leakage from these areas occurs. Some of these systems include underground pipes and tanks which the current aging management and inspection programs do not effectively inspect and monitor. NRC staff need consider that:

We know that over the last decade a series of events, occurring at a quickening pace and with increasing magnitude, have raised serious questions about whether nuclear facilities are in compliance with federal regulations governing the release of radioactive materials into the environment – leaks have been reported at the majority of reactors. The industry is "addressing" the issue by a voluntary reporting program. Public safety requires requirements.

Exposure to radiation, including tritium, can cause cancer, disease, genetic mutations and birth defects.

Recent discoveries of leaked radioactive water in other nuclear facilities have made it clear that current methods for monitoring systems and components such as buried pipes and underground tanks are inadequate. In addition, the older the structure in question, the more likely it is for leakages to occur.

Pilgrim is specifically vulnerable to undetected leaks in its underground pipes and tanks because it has nonconforming pipe fittings and flanges. The United States Government Accounting Office [14] reported that PNPS is suspected of having received counterfeit or substandard pipe fittings and flanges. This could make leaks of contaminated water more likely. There is no evidence in the applicant's filing that a thorough investigation at PNPS has

[14] United States General Accounting Office, Report to the Chairman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives, Nuclear safety and Health Counterfeit and Substandard Products Are a Government Wide Concern, GAO/RCED-91-6, October 1990.

occurred to determine precisely which pipe fittings and flanges are substandard and whether they have been upgraded to meet standards.

The Aging Management Program at Pilgrim does not provide adequate inspection of systems and components such as underground pipes and tanks. Appendix B describes the Aging Management Program for buried pipes and tanks. This section says that buried components will be inspected when excavated during maintenance, and that a focused inspection will be performed within ten years unless an opportunistic inspection occurs within this period – the focused inspection described is an untested Ultrasonic Test.

Pilgrim does not have monitoring test wells around, for example, buried pipes and tanks to detect leaks.

The topography of the Pilgrim site is such that, were a leak to develop in an underground pipe or tank, the contaminated water would most likely migrate seaward and drain into Cape Cod bay.

The only effective way to monitor for such an occurrence would be to have on-site monitoring wells located between Pilgrim and the ocean.[15] A suitable array of wells, sampled regularly, could be used to test that the inspection program is working properly.

4. Socioeconomic Impacts (p.7-4):

Again the staff identified no new and significant information and concluded that there would be no socioeconomic impacts associated with decommissioning.

Example: Leaks into Cape Cod Bay could significantly impact our air and water quality – not to mention socioeconomic impacts on our fishing and tourist industry and valuation of properties.

[15]Topography source: Pilgrim Nuclear Power Station, Boston Edison Company Docket No. 50-293, May 1972 –U.S. Atomic Energy Commission, Division of Radiological and Environmental Protection, Final EIS "The station site is along the rocky western shoreline of Cape Cod Bay. The geology of the site is recognized as primarily glacial deposits. The natural surface stratum in the station area consists of approximately 20 feet of silty and clayey fine sands with scattered boulders. Bedrock is about 30 to 90 feet below mean sea level." P. 9 "Surface topography is such that surface drainage from the station is seaward and surface water will not leave the Station property otherwise." P. 10.

V. MARINE AQUATIC RESOURCES [2.2.5; 4.0]

The staff concludes that cumulative impacts of PNPS license renewal would be SMALL for most potentially affected resources, with the exception of the local winter flounder population and Jones River population of rainbow smelt, for which impacts would be MODERATE (p.9-5).

Methods used to Assess Impact: How did NRC come to their conclusion when marine impact can not be assessed at present because definite numbers have not been set on what constitutes "significant impact." A yardstick has to be firmly established for each species (plant and animal) with appropriate federal, state and independent partners and rationales provided to the public; and Thermal backwash as not considered. During a thermal backwash, about 155,000 gpm of heated water (>105°F) is sent into the intake embayment for a period of about 1.5-2 hrs. Studies to evaluate potential impacts of the thermal backwash have not been performed.

Determining Impact:

There appear to be many methods used to determine impact, each with drawbacks. It must be determined before going forward with the re-licensing process what methods provide the most reliable estimates of impact, with a detailed rationale; a requirement that these methods are followed by the licensee unless better methods are established and independently approved.

We understand that there has been no policy statement regarding losses on a square mile basis by any state or federal agency. NRC should in its review process determine what percent loss is a significant detriment to any population [figure depending on population], with a detailed rationale.

Entrainment: *Winter Flounder – methods used by Entergy to determine impact*

1. Equivalent adult method: "researchers conducting this work have assumed an otter trawl efficiency of 50%, but the actual efficiency may be much lower (or higher), which would alter the number of fish in the study area per square mile and the apparent impact. Second, entrainment sampling results are quite variable. Third, it is difficult to determine the accuracy, and therefore, the applicability, of the survival matrix used in estimating equivalent adults."

Whether or not these levels of impact are a "significant" detriment to the population, and will result in slowing the return to much higher population densities, is currently unknown and a policy

statement regarding losses on a square mile basis has not been issued by any of the state or federal agencies. EPA Region 1 has stated in the past that population impacts of 5% or greater are typically of concern. However, to DEP's and Pilgrim Watch's knowledge, the geographic bounds of this particular population have not been agreed upon by state or federal agencies.

2. 2nd method - estimate the percentage of the total larval population passing in front of the facility that is entrained

3. The third method used by the facility to evaluate impact was the RAMAS (Risk Analysis Management Alternative System; Ferson, 1993) winter flounder model. It was used from 1999-2001 to further evaluate the effects of the facility on the Cape Cod Bay winter flounder population. Results suggested that stock reductions from 2.3 to 5.2% might occur as the direct result of entrainment at the facility.

It should be determined and agreed upon by NRC, appropriate state agencies and independent analysts what method or methods actually provide accurate information needed to assess more accurately impact before the license is approved.

4. An analysis of Backwash effects has not been performed to the best of our knowledge.

4.1.4 Potential Mitigation Measures: 12 measures are listed; however "The NRC staff has not conducted an analysis of each of these measures relative to their applicability to PNPS... It is expected that a more thorough analysis of the costs and benefits of these technologies would be conducted as part of the 316(b) CDS currently being conducted by PNPS in support of the NPDES permit renewal."

Missing from the list is thermal discharge – allowable maximum temperature of the water discharged and its measurement. Discharge temperature is now averaged over an hour; instantaneous measurement should be required. We are told that instantaneous releases have been over the allowable limit. Those reading do not appear on the record because they can be countered by a lower release – a way to cook the books and the fish that happen to be swimming by at the wrong time.

5. Cape Cod Bay is an Ocean Sanctuary. Therefore greater consideration of a wider range of species needs to be analyzed further.

Submitted by,
Mary Lampert
Pilgrim Watch, Director
148 Washington Street, Duxbury MA 02332

PNPS-D-KK

Clean Water Action * Environment Massachusetts * Toxics Action Center

February 28, 2007

Chief, Rules Division and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

Re: Comments on NUREG-1437, Supplement 29, draft

To Whom It May Concern:

Thank you for the opportunity to provide comments on the draft Environmental Impact Statement for Pilgrim Nuclear Power Station (NUREG-1437, Supplement 29).

The three signatories strongly support the comments submitted by Pilgrim Watch. We concur that the draft Environmental Impact Statement ignores new and significant information and relies on incorrect assumptions about Nuclear Regulatory Commission (NRC) regulations as they relate to environmental and public health impacts.

One particular point of concern is NRC's conclusion that the alternatives to relicensing would have a significantly higher negative impact on the environment than relicensing. In Section 8.2.5.11, NRC downplays the potential of using energy efficiency to replace Pilgrim's capacity, citing federal and state forecasts that incorporate conservation measures and still show rising demand over the next several decades. The assumption that energy efficiency cannot reverse the trend of rising demand is incorrect. Efficiency is becoming far more widely accepted as an alternative to supply, and New England is poised to ramp up efficiency investments significantly. Current regulatory barriers to efficiency will likely begin to fall as well – as they did last year in Rhode Island, when the state adopted legislation that will require utilities to look at efficiency as a cheaper alternative to supply. The low costs of efficiency – approximately 1/3 the cost of wholesale power[1] – are no small reason for newfound enthusiasm in the region.

In considering the alternatives to relicensing, NRC should consider a scenario with greatly expanded energy efficiency investments in the region. As proposed in Section 8.2.6, efficiency could be combined with other alternatives to replace Pilgrim's capacity.

In general, the Pilgrim plant suffers from the same persistent problems of safety, security and storage as the nuclear industry in general. Even within the narrow scope of this review of the impacts of relicensure, there is ample evidence for denying the extension. Daily radiation releases, the vast amounts of radioactive waste stored on site at the plant, damaged fisheries, and the risk of a terrorist attack are just some of the compelling reasons for letting the plant be decommissioned at the end of its planned lifespan – in 2012.

[1] See "Energy Efficiency: The Smart Way to Reduce Global Warming Pollution in the Northeast." National Association of State PIRGs. August. 2005. http://www.newenglandclimate.org/files/rggiefficiency2005.pdf

Given the many unanswered or inadequately answered questions about the environmental and public health impacts of extending the life of this plant, we respectfully ask that this commission approach the re-licensing of the Pilgrim nuclear plant with great caution and take into account the many concerns raised by the opponents of re-licensing. We are confident that, taking the entire picture into account, there will be ample grounds for denying relicensure.

Sincerely,

Brian Thurber, Energy Coordinator
Clean Water Action

Frank Gorke, Director
Environment Massachusetts

Alyssa Schuren, Executive Director
Toxics Action Center

PNPS-D-HH

HARMON, CURRAN, SPIELBERG & EISENBERG, LLP
1726 M Street, NW, Suite 600 Washington, DC 20036 (202) 328-3500 (202) 328-6918 fax

February 28, 2007

By first-class mail and e-mail to:
Michael Lesar
Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration, Room T-6D59
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852-2746
PilgrimEIS@nrc.gov

SUBJECT: *Comments on Draft Supplement 29 to Generic EIS for License Renewal of Nuclear Plants, Pilgrim Nuclear Power Plant*

Dear Mr. Lesar:

On behalf of Massachusetts Attorney General Martha Coakley, we are writing to submit comments on Draft Supplement 29 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (December 2006) ("Draft Supplemental GEIS"), which purports to evaluate the environmental impacts of renewing the operating license for the Pilgrim nuclear power plant. The Draft Supplemental GEIS is inadequate to satisfy the requirements of the National Environmental Policy Act ("NEPA") or NRC regulations for the implementation NEPA, because it fails to address new and significant information regarding the potentially severe adverse environmental impacts of continued high-density pool storage of spent fuel at the Pilgrim nuclear power plant.

We hereby renew the Attorney General's June 15, 2006, comments on the scope of the Draft Supplemental GEIS, including our previous request that you consider the technical information contained in the Hearing Request which was attached to our Scoping comments.[1] Our Scoping Comments were summarily dismissed in the NRC Staff's September 26, 2006, scoping decision and ignored in the Draft Supplemental GEIS.[2]

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[1] Letter from Diane Curran and Matthew Brock to Chief, NRC Rules and Directives Branch (June 15, 2006) ("Scoping Comments"), enclosing Massachusetts Attorney General's Request for a Hearing and Petition to Intervene With Respect to Entergy Nuclear Operations Inc.'s Application for Renewal of the Pilgrim Nuclear Plant Operating License, etc. (May 26, 2006) ("Hearing Request"). The Attorney General is

HARMON, CURRAN, SPIELBERG & EISENBERG, LLP

Michael Lesar
Chief, Rules and Directives Branch
February 28, 2007
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As stated in our Scoping Comments, the Supplemental GEIS for the Pilgrim nuclear power plant should address the environmental impacts of a severe accident in the Pilgrim fuel pool, including accidents caused by equipment failures, natural disasters, and intentional malicious acts. The Supplemental GEIS should also consider a reasonable array of alternatives for avoiding or mitigating the impacts of a severe pool fire, including combined low-density pool storage and dry storage of spent fuel.[3]

In addition, the Draft Supplemental GEIS should incorporate the Commission's decision to consider the issues raised by the Attorney General's Scoping Comments and Hearing Request in a generic rulemaking proceeding.[4] The Commission initiated the rulemaking proceeding in November of 2006 by publishing the Attorney General's August 29, 2006 rulemaking petition in the Federal Register for public comment.[5] It is therefore premature for the Draft Supplement GEIS to reach any conclusions regarding the environmental impacts of high-density pool storage of spent fuel at the Pilgrim nuclear power plant.

Finally, the Staff should confirm that under NEPA, the Staff is precluded from issuing a permit for renewed operation of the Pilgrim nuclear power plant unless and until the results of the rulemaking proceeding have been taken into account in the Pilgrim license renewal case.

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not re-submitting the Scoping Comments or the Hearing Request, because the NRC already has copies.

[2] Letter from Rani Franovich, Branch Chief, Environmental Branch B, to Michael R. Kansler, President of Entergy Nuclear Operations, Inc. ("Entergy"), attachment at 4-45; Draft Supplemental GEIS, Section 4.7.

[3] In addition, we wish to inform you that on January 16, 2007, the U.S. Supreme Court denied a petition for review of a decision by the U.S. Court of Appeals for the Ninth Circuit that was cited in our Scoping Comments, *San Luis Obispo Mothers for Peace v. Nuclear Regulatory Commission*, 449 F.3d 1016 (9th Cir. 2007). The decision is reported at 2007 U.S. LEXIS 1028.

[4] *Entergy Nuclear Vermont Yankee L.L.C. and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station) and *Entergy Nuclear Generation Company and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-07-03, _ NRC _, slip op. at 8 (January 22, 2007).

[5] *See* Notice of Petition for Rulemaking, Docket No. PRM-51-10, 71 Fed. Reg. 64,169 (November 1, 2006).

Michael Lesar
Chief, Rules and Directives Branch
February 28, 2007
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Sincerely,

/s/
Diane Curran

/s/
Matthew Brock, Assistant Attorney General
Environmental Protection Division
Office of the Attorney General
One Ashburton Place
Boston, MA 02108

From: Robert S. Knorr, Director [Robert.Knorr@state.ma.us] PNPS-D-II
Sent: Wednesday, February 28, 2007 4:18 PM
To: nrcrep@nrc.gov
Subject: Response from "Comment on NRC Documents"

Below is the result of your feedback form. It was submitted by

Robert S. Knorr, Director (Robert.Knorr@state.ma.us) on Wednesday, February 28, 2007 at 16:18:26

Document_Title: Draft Supplemental Environmental Impact Statement on the Pilgrim Nuclear Power Station located in Plymouth Massachusetts [NUREG-1437, Supplement 29 Draft SEIS Pilgrim Nuclear Power Station]

Comments: The purpose of this letter is to provide comments on the Draft Supplemental Environmental Impact Statement on the Pilgrim Nuclear Power Station located in Plymouth Massachusetts [NUREG-1437, Supplement 29 Draft SEIS Pilgrim Nuclear Power Station].

The comments provided specifically address section 4.7 ("Evaluation of New and Potentially Significant Information on Impacts of Operation during the Renewal Term), pages 4.65-4.66. This section discusses the Southeastern Massachusetts Health Study (SMHS) that was conducted by the Massachusetts Department of Public (MDPH).

On page 4.66, beginning on line 5 text reads "...with regard to the SMHS, NRC has considered the relevant information in these citations and concludes that the peer reviews and even the authors now agree that the SMHS does not demonstrate a causal relationship between the PNPS effluents and the potential effect of excess cancers in the areas around the site." The MDPH believes this statement is neither a correct summarization of the peer reviews nor the author's published or unpublished opinions. The correct summarization of the second peer review panel would be that:

1. The findings cannot be readily dismissed on the basis of methodological errors or proven biases; 2. The association found between leukemia and proximity to the Pilgrim nuclear facility was unexpectedly strong and, this raised concern regarding the biologic plausibility of the study; and 3.However, because the study results could not be dismissed, further study may be warranted, including expanding case finding and including children.

The specific statement in the draft report found on page 4-66, lines 7-8, "the SMHS does not demonstrate a causal relationship between the PNPS effluents and the potential effect of excess cancers in the areas around the site", is specifically not correct for the following reasons. The MDPH report specifically states that it is not possible to reach definitive conclusions regarding cause and effect but that the results should be followed up to clarify their public health implications. This conclusion is consistent with that stated by the peer reviewers. While the findings of the study may not support a causal relationship, the NRC arguments in the

Supplemental Impact Statement ignore the principal MDPH and peer review conclusions that the findings cannot be dismissed and that further attention to the possible risks associated with the power plant may be warranted.

We would be happy to answer any questions you may have, or provide additional clarification. Please feel free to contact us at 617-624-5757.

organization: Massachusetts Department of Public Health

address1: Center for Environmental Health

address2: 250 Washington Street, 7th Floor

city: Boston

state: MA

zip: 02108

country: US

phone: 617-624-5757

From: McCormack, Paul E. [Paul.E.McCormack@ibtco.com] PNPS-D-JJ
Sent: Wednesday, February 28, 2007 3:06 PM
To: PilgrimEIS@nrc.gov
Subject: Pilgrim Nuclear Power Station

1. My concern has to do with the spent fuel which is stored onsite.

Although the Commission found that the site can safely accommodate the on site storage of the additional volume of spent fuel, it seems to have operated under the assumption that there will be a permanent repository developed in some remote part of the United States. Given that such a storage site needs to be in some remote, stable part of the United States, I do not understand how the Commission can think that the permanent storage of spent fuel in Plymouth, which is not as remote and is not as geographically as sites such as Yucca Mountain, Nevada.

When the Plymouth Nuclear Plant was first approved, the working assumption was that only temporary storage of spent fuel would be required on site. Given that during the past 30+ years, no fuel has been shipped off-site, a prudent person would have to look at the storage as permanent. As such, the Plymouth on site storage should be looked at as if permanent and the requirements should be as strict as those used in choosing a "permanent repository". I do not think that the Plymouth site would qualify.

At the least, the NRC should insist that the operator treat the spent fuel storage as permanent and provide the safest type of storage possible. At this time, I do not believe that pool storage is the "safest" means for a permanent storage.

Regards,

Paul McCormack

Paul E. McCormack

PNPS-D-LL

From: Diana W [dianaweb@comcast.net]
Sent: Wednesday, February 28, 2007 5:36 PM
To: PilgrimEIS@NRC.gov
Subject: Pilgrim Nuclear Power Station Licence Renewal - comments

Dear Director of Administrative Services,

The following are comments I have regarding the **Pilgrim Nuclear Power Station's application for license renewal**.

Unfortunately, due to time constraints I was unable to cover all the available material. However, I did look at Supplement 29 in depth and up to page 241 and the section on "Potential Mitigating Measures".

As much as I was able to cover the material it appears there are certain issues associated with the plants operation as it relates to the environment surrounding PNPS. Specifically, my main concern relates to the population of fish and other marine aquatic species effected by the operation of PNPS. The following is an outline of specific problems I have found while reviewing Supplement 29 draft.

I was impressed with the outline discussing "Potential Mitigating Measures" and consequently the marine aquatic population.

PNPS is obligated as a co-habiter of it's surrounding Cape Cod Bay ecosystem to make necessary improvements to the cooling system as it currently operates.

Some of the best solutions for improvement to Aquatic Marine Populations and Cape Cod Bay waters from the list seem to be the following (as outlined in Supplement 29).

Automated chlorine monitoring

Alternative intake systems

Alternative intake screen systems

Variable speed pumps

Closed cycle system

If a closed cycle system includes changes in the use of water from Cape Cod Bay to another source not associated with the surrounding environment, then this would solve the problems associated with entrainment, impingement and pollution of chlorine into Cape Cod Bay.

Further, if alternative intake systems refers to another source of water for cooling and again another source for disposing of the chlorinated water, then this would solve the problem of entrainment, impingement and pollution to Cape Cod Bay.

Habitat restoratation and fish stocking justify the loss of viable fish and may not solve the lessening of the fish population due to PNPS cooling systems operations.

Of the 35 species listed in Supplement 29, as effected by either entrainment and or impingement or both, 16 appear to be listed as possible fish consumed by humans. The effects on the fish by chlorination, heat shock and normal discharge of waste as the result of proximity to PNPS could potentially reach human population as the result of consuming the fish listed.

These fish include:

Mackerel, Black Sea Bass, Bluefin Tuna, Blue Fish, Pollock, Atlantic Cod, Haddock, Monkfish, Summer Flounder, Winter Flounder, Yellow Tail and Long Fin Squid. Again, the concern here is human consumption and the possible deleterious effects.

I hope as stated in the PNPS Supplement 29 discussion of potential mitigating measures does more than "only provide a brief overview of technologies." These technologies provide solutions to the problems regarding the continued use of PNPS as a power source and should be thoughtfully considered.

If the chlorination and hypochlorination occurs around the time when fish are spawning to produce offspring, (Spring, Summer, Fall),

and this time period lasts for 2 hours per day, with time through the plant of 5-10 minutes, then the amount of liquid chlorination effecting the fish population in Cape Cod Bay could be greater than what studies have shown. No study is definite and there is no data present in the report regarding the effect (long or short term) of chlorination to the marine aquatic ecosystem. This, I feel, is an important consideration evaluation of PNPS and it's relationship to the marine aquatic ecosystem. There should be further data collected and reported as to how much chlorination and chlorine is discharged into Cape Cod Bay.

I also have questions regarding some terminology. On page 47 of the PNPS Supplement 29 Draft it states:

"The service water system is continuously chlorinated in order to control nuisance biological organisms in the service water discharge."

I think it is vitally important to define here what a "nuisance biological organism" is and also regard definitively how this organism operates solely inside the confines of the PNPS ecosystem. This unidentified organism could play a vital part in the survival of this particular diverse marine ecosystem.

Further, the "clean liquid waste with abnormally high conductivity" that may or may not be

"evaluated for controlled release into the circulating water discharge canal through the liquid radioactive waste header." (Entergy 2006a).

It is not clear whether the discharge is sent into Cape Cod Bay or a separate enclosed area.

Also, "The liquid wastes are automatically transferred to the chemical waste receiver tanks when the sump is filled to a present level. After decay and storage, the chemical liquid wastes are evaluated for discharge or reprocessed" (or released?). (Entergy 2006a). Again, it is not clear how the evaluation process works to determine where the waste can be disposed of, in the Bay or not.

On or around p.70 there are details about sediment collected and analyzed from Mass Bay area. "Metals, PAH's, PCB's, pesticides and radionuclides" were found and identified, however, the conclusion of the data stated, " Mass Bay sediment were no more contaminated than those of other urban estuaries." They were concluded as being "healthy" and of no concern.

I understand the comparative analysis of this data as beneficial to the understanding of the sediment collected in Mass Bay. However, I feel the presence of toxins in the sediment should also be taken into account and evaluated as such. Describing the results of analysis as "healthy" due to their presence in "other urban coastal regions on the East Coast" seems to be faulty analysis and again, data should be analyzed and concluded on the basis of how these chemicals relate and effect the surrounding ecosystem.The effect can not be dismissed because other coastal estuaries exhibit similar toxins in the sediment.

Bald Eagles, red-bellied cooters, roseate terns, piping plovers, barn owls, arctic terns, least terns, vesper sparrows, northern parula and common tern all reside or have once resided in and around the PNPS area. They are also federally listed as endangered threatened species and depend on the PNPS area and surrounding area for survival. As early as 2005 juvenile Bald Eagles were observed at Plymouth Plantation and "wintering Bald Eagles occasionally occur in the area of PNPS.

Further "1400 feet of the transmission line ROW near it's southern and adjacent to the boundary of Myles Standish State Forest is designated **critical habitat** for the red bellied cooter. (**Critical habitat** is habitat that is considered essential to the conservation of the species and may require special management)."

These species are under the care of our federal government and PNPS is required to protect the place they live. If the PNPS site interfere with their viability and health, any problems caused by the operation of PNPS needs to be resolved immediately.

I am also very concerned with any release of radioactive effluent into the environment and need to ask how the dosage suggested on page 140 translates to lamens terms. Also, because this release of radioactive effluents has not changed and "the impact to the environment has not changed," how is this impact determined? How much is too much? How much radioactive effluence is OK? Who makes this determination?

I am very pleased with the policy of PNPS and the governmental policy as follows:

"Entrainment of fish and shellfish into the cooling water system is a potential adverse environmental impact that could be minimized by use of the best available technology."

"Licenses are required to demonstrate compliance with the phase 2 requirements at the time of renewal of their NPDES permit."

Also, I hope there is careful consideration regarding,

"Entrainment of fish and shellfish in early life stages into nuclear power plant cooling water system" as "considered a catagory 2 issue, thus requiring a site specific assessment for the license renewal review."

It is also clearly stated in supplement 29, "section 316 (b) of the clean water act (CWA) requires the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts."

Important data will be the result of the Entergy study regarding PNPS cooling systems. Especially in light of the EPA 316(b) regulations.

In the regulation it is stated "plants must minimize adverse environmental impacts associated with water intake systems." and "performance standards are designed to significantly reduce entrainment and impingement losses due to plant operations."

Finally, although winter flounder is the only fish present in category 2 and subject to review, it appears data and collection of data might be altered to gain more accurate representation of how many larvae, eggs and fish are adversely effected by PNPS cooling system. Less than 1% appears to be a general category to place all the fish in various stages collected for analysis. Perhaps better technology could result in more accurate data.

For example, if there are 600,000 winter flounder present at egg or larval stages and 1% die from exposure to plant daily operations this would account for less than 6,000 winter flounder deaths. This amount may appear as 1% to be small, however when it is shown as 6,000 it appears there is a much greater problem.

I also feel the occurrence of heat shock as a category 2 issue should be thoroughly examined and data taken as to how fish are effected by this occurrence.

Thanks for your time and patience in reviewing my comments. They were written and sent in the hopes they will help in the determination of what can be done to improve the relationship between the PNPS and the surrounding ecosystem.

With the right technology, or as said in the Supplement, the best technology, it seems PNPS could stay in operation.

There is a lot of room for improvement.

Sincerely,

Diana L Woebcke

Yarmouth Port, MA Resident

PNPS-D-MM

Entergy

Entergy Nuclear Operations, Inc.
Pilgrim Station
600 Rocky Hill Road
Plymouth, MA 02360

Stephen J. Bethay
Director, Nuclear Assessment

February 27, 2007

Mr. Michael Lesar
Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No. 50-293 License No. DPR-35

Comments on Draft Generic Environmental Impact Statement:
NUREG-1437 Supplement 29 Regarding Pilgrim Nuclear Power Station

REFERENCE: Entergy letter, License Renewal Application, dated January 25, 2006 (2.06.003)

Draft Report for Comment NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 29, Regarding Pilgrim Nuclear Power Station, December 2006

LETTER NUMBER: 2.07.017

Dear Sir or Madam:

In the referenced Entergy letter, Entergy Nuclear Operations, Inc. applied for renewal of the Pilgrim Station operating license. NRC TAC NO. MC9669 was assigned to the application.

The referenced draft NUREG was issued in December 2006, after NRC license renewal staff review of the environmental portion of the License Renewal Application. The NUREG provided the opportunity to submit comments on the NUREG for consideration by the NRC staff by February 28, 2007. Enclosures 1 and 2 of this letter provide Entergy Nuclear Operations, Inc. comments on the referenced draft NUREG.

Also, a compact disc, containing the 1990 Southeastern Massachusetts Health Study and other materials related to the study, was included with the copy of this letter that was mailed to Ms. Alicia Williamson, NRC Project Manager. The study and materials were discussed during the NRC Public Meeting held on January 24, 2007 to solicit comments on the draft NUREG.

This letter contains no commitments.

Please contact Mr. Bryan Ford, (508) 830-8403, if you have any questions regarding this subject.

Sincerely,

Stephen J. Bethay
Director, Nuclear Safety Assessment

DWE/dl
Enclosures: (as stated)
cc: see next page

cc: with Enclosures

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ENCLOSURE 1 to Letter 2.07.017
(26 pages)

Comments on Draft NUREG-1437 Supplement 29

ENCLOSURE 1
Comments on Draft NUREG-1437 Supplement 29

Note: The page number(s) and line number(s) cited in the following listing correspond to the page number(s) and line number(s) as identified in the published hard copy version of draft NUREG-1437 Supplement 29, not the pdf version of the NUREG.

#	Page	Line Number(s)	Comment
1	xxi	17-18	The sentence "Additional mitigation to minimize the impacts of entrainment and impingement may be justified." should be deleted. In addition to mitigation already being addressed in the last sentence of this paragraph (Lines 20–22), with the EPA recognized as the regulating authority, the NRC is not known to have been delegated authority under the Clean Water Act to make recommendations regarding mitigation measures associated with "aquatic matters".
2	1-8	10-11	The number of homes serviced by electricity from PNPS is grossly understated. Rather than 13,000 homes, previous estimates by the electrical system transmission and distribution operator (NSTAR) identified the number to be about 550,000 homes.
3	2-1	24	There is no "Boston Edison Company 1974" reference in the Section 2.3 reference.
4	2-1	24-25	Plant nominal ground level is 23 ft above MSL. Thus most major structures are situated at or above 23 ft MSL
5	2-1	32	There is no "Boston Edison Company 1974" reference in the Section 2.3 References.
6	2-4	5	The plant is accessed via Power House Road. It is no longer called Edison Access Road.
7	2-4	12-14	The "nature area" has been closed to the public since shortly after 9/11/2001 but limited use is allowed to employees of PNPS. It is no longer referred to as a nature area and the trails, etc. are not currently maintained as a nature area.
8	2-7	12	Suggest deleting the space after "MSL".
9	2-7	18-19	The sentence "Debris and large, impinged organisms are removed from the bar racks using a mechanical rake." should be changed to read "Debris and large, impinged organisms are removed from the bar racks using divers." since the mechanical rake is not currently used.

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
10	2-7	38-40	The sentence "The mixture is used to ensure the total residual chlorine discharge concentration does not exceed a maximum daily concentration of 0.10 parts per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge." is incorrect. The Condenser Cooling Water NPDES Permit total residual chlorine limitations are "0.10" maximum daily and "0.1" average monthly. The Plant Service Cooling Water NPDES Permit total residual chlorine limitations are "1.0" maximum daily and "0.5" average monthly.
11	2-9	12-14	Suggest changing the sentence "Since the chlorination events ...only one pump." to "Condenser chlorination is usually conducted only when both circulating water pumps are running."
12	2-10	38	Based on the PNPS NPDES Permit and Table 2-2 of the PNPS Draft SEIS, there are no temperature limitations on the service water. Therefore, the sentence "The permitted change in temperature across the service water is 5 to 10°F." is incorrect and should be deleted.
13			Comment number not used.
14	2-12	19-20	Fission products are not "normally" released from the fuel rods. However, on rare occasions, a small defect in a fuel rod can occur which allows small amounts of fission products to be released to the reactor coolant.
15	2-13	30	The word should be "Thermex", not "thermix".
16	2-16	2	It is unclear why the High Pressure Coolant Injection System is singled out here. A number of systems could conceivably cause steam leakage outside primary containment that would be monitored by the reactor building vent system.
17	2-17	8-10	These 3 lines are an exact repeat from the previous paragraph (lines 2-5).
18	2-17	30	Typo – "resuse" should be "reuse".
19	2-20	31-32	Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth.
20	2-21	3	Suggest deleting the redundant "the" in the sentence "The Entergy-owned property boundary, including ~~the~~ the PNPS site and the woodlands tract, is shown in Figure 2-3."

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
21	2-21 2-92	13-14 16, 18-19	There are contradictory statements regarding the transmission ROW (right of way) crossing state parks, etc. Page 2-21 (lines 13-14) indicates the ROW is within the Myles Standish State Forest while Page 2-92 (line 16) indicates the ROW "does not cross any state or federal parks" and lines 18-19 (Page 2-92) has the same wording as Page 2-21 (lines 13-14).
22	2-22	30	Suggest changing "and NPDES permit" to "a NPDES permit".
23	2-23	33	The sentence "Notes: For the majority of outfalls, the pH shall not be greater than or less than 0.5 standard units of the influent." is inaccurate. Only four outfalls have the "0.5" limit while one outfall has no pH limit, and five outfalls have pH values that range from 6.0 to 8.5. Therefore, the majority of the outfalls do not have the "0.5" value.
24	2-21	27-28	This should also state that PNPS received certification from the Commonwealth of Massachusetts Office of Coastal Zone Management (letter dated 7/11/06), instead of only that the certification was filed.
25	2-25	1	Suggest changing "100 mg/L" to "1000 mg/L" to accurately reflect the limitations outlined in the PNPS Groundwater Discharge Permit.
26	2-25	19	Suggest changing "50.751(g)" to "50.75(g)(1)" to accurately reflect the regulatory citation.
27	2-26	35	Line 35 needs to be deleted since it is currently an empty space and separates a continuing sentence.
28	2-27	14-15	The sentence "Massachusetts was designated as being in "moderate nonattainment" of the 8-hour ozone standard in June 2005." should have a reference.
29	2-27	24-25	Suggest deleting the sentence that starts with "This permit limits..." The emissions cap is not a permit and only limits emissions on a rolling 12 month basis.
30	2-28	1-2	Suggest deleting the first sentence that starts with "Water depths...", and replace with "Water depths in the vicinity of PNPS are typically 10 ft and up to 120 ft within 5 miles off shore of the site."
31	2-30	8-9	On Page 2-11 (lines 30-32) it is stated that "The sediments were described as having relatively low concentrations of the chemical parameters tested polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, ...". However, Page 2-30 (lines 8-9) states "PAHs, pesticides, and PCBs were not detected in any sediment sample." These statements appear to contradict each other.

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
32	2-30	22-24	Suggest changing the sentence "However, these tests indicated that sediment from the intake embayment would have a significant impact on the survival of the amphipod (*Ampelisca abdita)*, and the development of the larval stage of the blue mussel (*Mytilus edulis*)." to "Although unrelated to PNPS operations, these tests indicated that sediment from the intake embayment would have a significant impact on the survival of the amphipod (*Ampelisca abdita)* and the development of the larval stage of the blue mussel (*Mytilus edulis*)."
33	2-35	38	The reference "NEFMC 1998" is intended to be either "NEFMC 1998a" or "NEFMC 1998b" based on the references listed in the Section 2.3 References.
34	2-36	14	The reference "NEFMC 1998" is intended to be either "NEFMC 1998a" or "NEFMC 1998b" based on the references listed in the Section 2.3 References.
35	2-41	28-29	Suggest changing "Cargnelli 1999e" to "Cargnelli, et al. 1999e" since the Section 2.3 references does not list a reference only for Cargnelli 1999e.
36	2-42	32-34	The wording "approximately several miles" in the sentence "Jones River, located approximately several miles north of PNPS, has its headwaters in Pembroke, Kingston, and Plympton before it empties into Plymouth Harbor (Lawton et al. 1990 in ENSR 2000)." should be reworded. Suggest "approximately" be deleted from this sentence.
37	2-43	3	The "McKenzie 1964" reference is not listed in the Section 2.3 References.
38	2-45	11	The reference "NMFS 2003" is intended to be either "NFMS 2003a" or "NFMS 2003" based on the references listed in the Section 2.3 References.
39	2-49	15	The reference "Provincetown Center for Coastal Studies 2006" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References.
40	2-50	31-33	Suggest inserting the wording "due to the breakwater walls providing an ideal habitat" after "grounds" and "therefore" between "habitat" and "cunner" so that the sentence reads "The PNPS area is a cunner spawning and nursery grounds due to the breakwater walls providing an ideal habitat; therefore, cunner have a high incidence of entrainment and impingement at PNPS relative to other species (Lawton et al. 2000)." This would be a more accurate statement of facts whereas the draft wording could be mis-leading.
41	2-54	24	The "Woods 1982" reference is not listed in the Section 2.3 References.

ENCLOSURE 1
Comments on Draft NUREG-1437 Supplement 29

#	Page	Line Number(s)	Comment
42	2-55	22	The reference "Steimle 1999b" should be changed to "Steimle et al. 1999b" as shown in the Section 2.3 References.
43	2-58	15-17	Suggest deleting the sentences "Rock gunnel larvae have been collected in the PNPS entrainment sampling." and "Juveniles and/or adults have also been observed in the PNPS impingement sampling program." since these are repeats of the previous two sentences.
44	2-58	32	The "Morse 1978" reference is not listed in the Section 2.3 References.
45	2-62	30	The "Terciero 1995" reference is not listed in the Section 2.3 references. Moreover the correct spelling ("Terceiro") appears to be that as identified on Page 2-167 (lines 1-2 and 3-4).
46	2-63	18	The "NFSC 1998" reference is not listed in the Section 2.3 References.
47	2-63	18-23	The sentence "No life stages of the tautog have ever been observed in the PNPS entrainment sampling." contradicts the sentence (Lines 18 – 20) "Tautog eggs and larvae have been observed in the PNPS entrainment sampling (Normandeau Associates 2006a)." In addition, the sentence "Juveniles and/or adults have been observed in the PNPS impingement sampling program." is a repeat of the sentence (Lines 20 – 21) "...tautog have also been periodically collected as part of the PNPS impingement sampling (Normandeau Associates 2006b)."
48	2-66	32	The "Langton and Bowman 1981" reference is not listed in the Section 2.3 References.
49	2-67	39	Suggest changing "Chang et al. 199b" to "Chang et al. 1999b".
50	2-67	6	Suggest changing "Chang et al. 199b" to "Chang et al. 1999b".
51	2-67	10	There is no "Hendrickson 2000b" listing in the Section 2.3 References. Although there are two "Hendrickson 2000" listings in the Section 2.3 references, neither is listed as "2000b".
52	2-68	9-21	The comment is fully described in Enclosure 2.
53	2-68	21	The reference "NEFSC 2005" appears to be the source for "Figure 2-7"; however "NEFMC 2006" is listed as the source for "Figure 2-7". Therefore, there appears to be a discrepancy.
54	2-68	23-29	The comment is fully described in Enclosure 2.

ENCLOSURE 1
Comments on Draft NUREG-1437 Supplement 29

#	Page	Line Number(s)	Comment
55	2-69	19	Although there are "NEFMC 2006a" and "NEFMC 2006b" listings in the Section 2.3 references, there is no "NEFMC 2006" listing only.
56	2-73	4	Although there are "Cadrin 2000a" and "Cadrin 2000b" listings in the Section 2.3 references, there is no "Cadrin 2000" listing only.
57	2-73	12	Suggest changing "Cooper et al. 1998" to "Cooper and Chapleau 1998" to accurately reflect the listing in the Section 2.3 References.
58	2-73	21	Suggest changing "Cooper et al. 1998" to "Cooper and Chapleau 1998" to accurately reflect the listing in the Section 2.3 References.
59	2-73	21	There is no "DFO 1997" listing in the Section 2.3 References.
60	2-74	10	Suggest changing "Brodziak et al. 1996" to "Brodziak and Macy 1996" to accurately reflect the listing in the Section 2.3 References.
61	2-74	18	There is no "Cargnelli et al. 1999" listing in the Section 2.3 References.
62	2-74	32	Suggest changing "Hendrickson 2004" to "Hendrickson and Holmes 2004" to accurately reflect the listing in the Section 2.3 References.
63	2-74	34	Suggest changing "Hendrickson 2004" to "Hendrickson and Holmes 2004" to accurately reflect the listing in the Section 2.3 References.
64	2-74	40	Suggest changing "Hendrickson 2004" to "Hendrickson and Holmes 2004" to accurately reflect the listing in the Section 2.3 References.
65	2-76	10	There is no "Anjaru 1964" listing in the Section 2.3 References.
66	2-78	36	There is no "Matthiessen 1984" listing in the Section 2.3 References.
67	2-79	29-30	Suggest changing "Hart et al. 2004" to "Hart and Chute 2004" to accurately reflect the listing in the Section 2.3 References.
68	2-80	39	There is no "NEFSC 2004" listing in the Section 2.3 References.
69	2-80	11	There is no "Hines 1991" listing in the Section 2.3 References.

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
70	2-83	11	"RWQCB 2004" should be changed to "CRWQCB 2004" to accurately reflect "California Regional Water Quality Control Board".
71	2-83	22	"Marine Mammal Protection Act (MMPA) of 1972" should be listed in the Section 2.3 references to be consistent with other regulatory Acts listed in the Section 2.3 References.
72	2-83	32	The reference "Provincetown Center for Coastal Studies 2006a" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References.
73	2-83	34	The reference "Provincetown Center for Coastal Studies 2006a" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References.
74	2-84	1	The reference "Provincetown Center for Coastal Studies 2006a" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References.
75	2-84	3	The reference "Provincetown Center for Coastal Studies 2006a" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References.
76	2-84	10	The reference "Provincetown Center for Coastal Studies 2006a" should be changed to "Prescott 2005" to accurately reflect the listing in the Section 2.3 References.
77	2-84	25	Although there are "NHESP 2006a" and "NHESP 2006b" listings in the Section 2.3 references, there is no "NHESP 2006" listing only.
78	2-85	22	Suggest deleting the comma after "Prescott".
79	2-85	28	Suggest deleting the "t" after "to".
80	2-85	32	Suggest changing "Entergy 2006" to "Entergy 2006a" to accurately reflect the source and listing in the Section 2.3 References.
81	2-85	34	Suggest changing "Entergy 2006" to "Entergy 2006a" to accurately reflect the source and listing in the Section 2.3 References.
82	2-87	8	Although there are "NHESP 2006a" and "NHESP 2006b" listings in the Section 2.3 references, there is no "NHESP 2006" listing only.
83	2-87	14	Although there are "NHESP 2006a" and "NHESP 2006b" listings in the Section 2.3 references, there is no "NHESP 2006" listing only.

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
84	2-93	34-35	Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 2.3 references, there is no "FWS 2006" listing only.
85	2-97	31	Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 2.3 references, there is no "FWS 2006" listing only.
86	2-98	3	Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 2.3 references, there is no "FWS 2006" listing only.
87	2-99	23-25	The "Entergy 2006a" reference at the end of the sentence "This program includes the collection, analysis, and evaluation of data in order to assess the radiological impact of PNPS on the environment and on the general public ..." is incorrect since the PNPS Environmental Report did not contain such as statement.
88	2-100	17	Suggest changing "Entergy 2003" to "Entergy 2003c" to accurately reflect the source and listing shown in the Section 2.3 References.
89	2-108	16, 18, 28	Suggest using Town of Plymouth or Plymouth, rather than Plymouth Town.
90	2-109	18	Suggest deleting the comma between "Commission" and "2003".
91	2-111	11	Suggest using Town of Barnstable or Barnstable, rather than Barnstable Town.
92	2-117	18	Suggest changing "Figure 2-12" to "Figure 2-11" to accurately reflect location of minority populations. Figure 2-12 shows low-income populations only.
93	2-123	1-14	PNPS (Entergy) should be listed as one of the largest employers. With over 700 employees, it would be the second largest employer in Plymouth per the numbers listed in this section.
94	2-124	3	Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth.
95	2-124	23-24	Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth.
96	2-124	32-33	Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth which was signed on March 5, 2002 and became effective for FY 2003, not 2007 as stated. It is NSTAR which has payments of $1 million which begin in 2007, not Entergy. Refer to 2nd paragraph of Section 2.7 in the PNPS Environmental Report.

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
97	2-125	25	Suggest changing "Entergy 2006" to "Entergy 2006a" to accurately reflect source and listing in the Section 2.3 References.
98	2-126	37	Suggest changing "Route 3a" to "Route 3A".
99	2-128	29	The "recreation area" has been closed to the public since shortly after 9/11/2001 but limited use is allowed to employees of PNPS. It is no longer referred to as a nature area and the trails, etc. are not currently maintained as a recreation area.
100	2-129	5, 9	The "recreation area" has been closed to the public since shortly after 9/11/2001 but limited use is allowed to employees of PNPS. It is no longer referred to as a nature area and the trails, etc. are not currently maintained as a recreation area.
101	2-129	26	Suggest changing "ACE 2006" to "USACE 2006" to accurately reflect the listing in the Section 2.3 References.
102	2-129	30	Suggest changing "ACE 2006" to "USACE 2006" to accurately reflect the listing in the Section 2.3 References.
103	2-134	22-23	The "Cadrin and King 2002" reference is not in the Sections 2.0 – 2.2 write-ups.
104	2-134	32	Suggest changing "RWQCB" to "CRWQCB" to accurately reflect "California Regional Water Quality Control Board".
105	2-143	15-16	The "Hart 2001" reference is not in the Sections 2.0 – 2.2 write-ups.
106	2-143	37	Suggest changing "Hendrickson, L. 2000" to "Hendrickson, L. 2000a" to match write-ups.
107	2-143	40	Suggest changing "Hendrickson, L. 2000" to "Hendrickson, L. 2000b" to match write-ups.
108	2-144	19-20	The "Idoine, J. Undated" reference is not in the Sections 2.0 – 2.2 write-ups.
109	2-145	37-38	The "Kocik and Brown 2001" reference is not in the Sections 2.0 – 2.2 write-ups.
110	2-150	21-23	The "Massachusetts Office of Coastal Zone Management 2006" reference is not in the Sections 2.0 – 2.2 write-ups.
111	2-151	8	Suggest changing "1998" to "1998b" to match write-ups in the Draft SEIS.

ENCLOSURE 1
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#	Page	Line Number(s)	Comment
112	2-155	31-33	The "National Marine Fisheries Services (NMFS) 2006e" reference is not in the Sections 2.0 – 2.2 write-ups.
113	2-156	39-41	The "Neilson 1986" reference is not in the Sections 2.0 – 2.2 write-ups.
114	2-157	4-6	The "New England Fishery Management Council (NEFMC) 1987" reference is not in the Sections 2.0 – 2.2 write-ups.
115	2-157	18-19	The "New England Fishery Management Council (NEFMC) 1999" reference is not in the Sections 2.0 – 2.2 write-ups.
116	2-157	21-23	The "New England Fishery Management Council (NEFMC) 2003a" reference is not in the Sections 2.0 – 2.2 write-ups.
117	2-158	29-31	The "Nuclear Regulatory Commission (NRC) 1996" reference is not in the Sections 2.0 – 2.2 write-ups.
118	2-159	1-4	The "Nuclear Regulatory Commission (NRC) 2006" reference is not in the Sections 2.0 – 2.2 write-ups.
119	2-160	1-3	The "Olsen and Merriman 1946" reference is not in the Sections 2.0 – 2.2 write-ups.
120	2-160	18	Suggest changing "Cadri" to "Cadrin" to reflect accurate spelling.
121	2-161	5-6	The "Pava et al. 1997" reference is not in the Sections 2.0 – 2.2 write-ups.
122	2-161	11-12	A space should be added between Lines 11 and 12.
124	2-161	15-16	A space should be added between Lines 15 and 16.
125	2-161	29-31	This reference is incorrect. The referred to document is email correspondence between Jill Brochu at Entergy and Robert Prescott. It is not available at the location noted. Also Robert Preston is employed at the Massachusetts Audubon Society, not the Provincetown Center for Coastal Studies. If the reference is for the fish study which has somehow been included, Robert Prescott is not the author and the date of 1/15/2005 would be incorrect.
126	2-162	5-7	The Reid et al. 1999a reference is a repeat of the reference shown on Lines 17 – 19.
127	2-162	38-39	Suggest changing "1986a" to "1986" to accurately reflect the listing in the Section 2.2.5 write-up.

ENCLOSURE 1
Comments on Draft NUREG-1437 Supplement 29

#	Page	Line Number(s)	Comment
128	2-163	12-14	The "Salerno et al. 2001" reference is not in the Sections 2.0 – 2.2 write-ups.
129	2-166	5-6	The "Stevenson 1936" reference is not in the Sections 2.0 – 2.2 write-ups.
130	2-167	18-20	The "Toner 1984b" reference is not in the Sections 2.0 – 2.2 write-ups.
131	2-167	33-34	The "Town of Plymouth 2006c" reference is not in the Sections 2.0 – 2.2 write-ups.
132	2-170	18-19	A space should be added between Lines 18 and 19.
133	2-170	27-29	Suggest adding "1982." to reflect actual year that material was published and to be consistent with how the reference is listed in the Section 2.2 write-up for the Monkfish (pp. 2-54 to 2-55).
134	4-12	16-17	Regarding "The abundance estimates in 2005 were <50% of the 1995-2004 time series. " This sentence, given without any perspective, may lead to the wrong conclusion about the status of winter flounder in Cape Cod Bay. The 2006 estimate of immature winter flounder was the fourth highest over the 12-year monitoring series, indicating that an ample amount of recruitment is occurring, which propagates the population in the vicinity of PNPS.
135	4-12	21	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
136	4-12	25	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
137	4-12	35	The 4% entrainment rate mentioned in this line was for stage four larvae only and was considered an artifact of the sampling methodology resulting from the difficulty in obtaining samples within a few feet of the bottom. The overall entrainment rates for the four surveys in 2002 were 1.28%, 0.95%, 0.11% and 0.07% respectively
138	4-12	29	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
139	4-12	33	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
140	4-12	38	There is no "MRI 2002" listing in the Section 4.10 References.

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#	Page	Line Number(s)	Comment
141	4-12	40	There is no "MRI 2002" listing in the Section 4.10 References.
142	4-13	2	There is no "MRI 2000" listing in the Section 4.10 References.
143	4-13	5	There is no "MRI 2000" listing in the Section 4.10 References.
144	4-13	5	There is no "MRI 2002" listing in the Section 4.10 References.
145	4-13	12	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
146	4-13	24-25	Regarding "...Jones River ... the principal spawning ground for smelt in the Plymouth area." Simply because adult and juvenile smelt are found in the vicinity of Plymouth does not mean they were spawned in the Jones River. Within approximately 20 nautical miles of PNPS there are about 20 smelt runs which are possible contributors to the smelt frequenting the coastal waters of Plymouth. This is important because it means the number of smelt that are impinged at PNPS must be measured against a pool of fish that is larger than the smelt population of the Jones River.
147	4-13	28-29	Regarding "PNPS had reduced the Jones River spawning population by less than 1% ..." This statement is based on the incorrect assumption that Rainbow smelt impinged at PNPS originate only from the Jones River. Smelt are highly mobile, and there is no information to suggest that even a majority of those caught on the screens spawned in the Jones River. Most smelt are impinged in the fall or early winter, after moving to coastal waters where mixing among the spawning populations from various sources has occurred.
148	4-15	14, 19-20, 21	Regarding "...significant events..." and "...high entrainment events can contribute a significant percentage of the overall annual entrainment numbers for certain species. " This statement(s) is misleading because – although its obvious that high ichthyoplankton densities in close proximity to the CWIS are expected to increase the annual entrainment numbers – it has not been determined that these are "events," or that they are anything more than natural fluctuations, when compared with the long-term data set. Use of the word "significant" is improper because it is in quotes yet it is not used at all in the pertinent section of the referenced Annual Report, and it is not statistically appropriate. This statement is not a basis for determining a trend or establishing that an impact exists, so its relevance is unclear.

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#	Page	Line Number(s)	Comment
149	4-21	2-7	Regarding "Normandeau (2006a) compared recent estimates of the loss of age 3 adults ..." The text referring to Table 4-4 references Normandeau as the source, and discusses the estimated percent loss of adults as if this terminology is used in the 2005 Annual Report referenced. However, the headers (description of data columns) presented in Table 4-4 are quite different from those in the reference document. One is also incorrect; the Area-Swept survey should be all adult winter flounder (those equal to or longer than 280 mm TL) not just age-3 fish. Please duplicate the entire table as it appeared in the original source, or eliminate the citation altogether.
150	4-21	25	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
151	4-21	27-28	The comment is fully described in Enclosure 2.
152	4-21	28	Although there are "MRI 2005a" and "MRI 2005b" listings in the Section 4.10 references, there is no "MRI 2005" listing only.
153	4-22		Figure 4-1 does not represent "the loss of adults from the local stock," it is the "numbers of equivalent adult winter flounder estimated from entrainment and impingement data at PNPS." It should be made clear that the equivalent adult method yields a hypothetical estimate not an actual measurement.
154	4-23	3	There is no "NEFSC 2003" listing in the Section 4.10 References.
155	4-23	8	Suggest changing "Figures 2-10 and 2-11" to "Figures 2-9 and 2-10" since reference to "Figure 2-11" is incorrect.
156	4-30	17	There is no "Entergy 2006" listing only in the Section 4.10 References.
157	4-23 4-24	42 1-3	This comment is fully described in the Enclosure 2 comments.

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#	Page	Line Number(s)	Comment
158	4-29	1-3	Rainbow smelt are schooling, pelagic fish, occupying inshore coastal waters and mid-waters of large lakes (Scott and Crossman 1973; Carlander 1969). They undertake significant migrations during their life history. In spring, typically March-May in New England, rainbow smelt leave coastal waters and travel to freshwater streams to spawn (Scott and Crossman 1973; Carlander 1969). Some individuals may travel up to 1000 km upstream to spawn (Froese and Pauly 1999). After spawning they return to coastal waters. Between the Cape Cod Canal and Boston Harbor there are approximately 21 streams and rivers that have been reported to support smelt runs. Since smelt emigrate to coastal waters following the spawning season mixing among populations from these other sources occurs during the summer months. Rainbow smelt are highly mobile, and there is no information to suggest that juveniles and adults impinged at PNPS originate only from the Jones River.
159	4-34 Thru 4-38	Section 4.1.4	Discussion of these alternatives and their possible application at PNPS should be left to the 316(b) process currently underway.
160	4-34 thru 4-38	Section 4.1.4	The NRC is not known to have been delegated authority under the Clean Water Act to make recommendations regarding mitigation measures associated with "aquatic matters". In addition, 316(b) is associated with numerical performance standards and does not define "impact". Mitigation measures in the future, if any, will be developed and jointly agreed upon between EPA Region I and Entergy as part of the 316(b) compliance process.
161	4-38	16	Suggest changing "Figure 2-5" to "Figure 2-6" since "Figure 2-5" shows the intake structure and not the transmission ROW (right of way).
162	4-50	4	There is no "MOCZM 2006" listing in the Section 4.10 References.
163	4-51	1	Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth.
164	4-51	8	Entergy has a PILOT (payment in lieu of taxes) arrangement with the Town of Plymouth which was signed on March 5, 2002 and became effective for FY 2003, not 2007 as stated. It is NSTAR which has payments of $1 million which begin in 2007, not Entergy. Refer to 2nd paragraph of Section 2.7 in the PNPS Environmental Report.
165	4-51	15-17	NSTAR payments are not payments made by PNPS, but are as the result of deregulation.

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#	Page	Line Number(s)	Comment
166	4-51	41	There is no "OCPC 2000" listing in the Section 4.10 References.
167	4-52	34	The "recreation "area" has been closed to the public since shortly after 9/11/2001 but limited use is allowed to employees of PNPS. It is no longer referred to as a nature area and the trails, etc. are not currently maintained as a recreation area.
168	4-54	33	Suggest changing "Figure 2-12" to "Figure 2-11" since "Figure 2-12" shows low-income populations and not minority block groups.
169	4-55	7	Suggest changing "percent" to "percentage" to correct a typographical error.
170	4-55	19	Suggest changing "Figure 2-13" to "Figure 2-12" since "Figure 2-13" shows facility layout and not low-income block groups.
171	4-58	29	There is no "NHESP 2006" listing in the Section 4.10 References.
172	4-58	31	There is no "Entergy 2006" listing only in the Section 4.10 References.
173	4-59	22	There is no "NHESP 2005a" listing only in the Section 4.10 References.
174	4-62	14	There is no "BEIR VII 2005" listing in the Section 4.10 References.
175	4-63	1-2	The Entergy references utilized in this discussion are incorrect since these references are associated with radiological environmental reports and not radioactive effluent release reports which is a separate report that deals with doses.
176	4-63	6	There is no "NRC 2005" listing in the Section 4.10 References.
177	4-65	3	Suggest changing "...in NRC 2006a..." to "...in NRC 2006a)." to correct a typographical error.
178	4-66	17	There is no "MPDH 1990" listing in the Section 4.10 References.
179	4-66	26	Suggest changing "Sever 1993" to "Sever et al. 1993" to accurately reflect the listing in the Section 4.10 References.
180	4-66	26	Suggest changing "Hoffman 1992" to "Hoffman et al. 1992" to accurately reflect the listing in the Section 4.10 References.

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#	Page	Line Number(s)	Comment
181	4-67	3	The Entergy references utilized in this discussion are incorrect since these references are associated with radiological environmental reports and not radioactive effluent release reports which is a separate report that deals with doses.
182	4-67	3	There is no "NRC 2005a" listing in the Section 4.10 References.
183	4-67	30	The Entergy references utilized in this discussion are incorrect since these references are associated with radiological environmental reports and not radioactive effluent release reports which is a separate report that deals with doses.
184	4-69	2	Suggest deleting "and" between "may" and "as" to correct a typographical error.
185	4-70	32	There is no "USACE 2006" listing in the Section 4.10 References.
186	4-77	28-31	The "Entergy Nuclear Operations, Inc. (Entergy). 2000" reference is not in the Section 4.0 write-ups.
187	4-78	4-7	The "Entergy Nuclear Operations, Inc. (Entergy). 2005b" reference is not in the Section 4.0 write-ups.
188	4-78	17	Suggest changing "Entergy Cultural Resources Procedure" to "Environmental Reviews and Evaluations" to accurately reflect the title of the procedure.
189	4-81	27-29	The "National Academy of Sciences (NAS). 1972" reference is not in the Section 4.0 write-ups.
190	4-81	31-34	The "National Academy of Sciences (NAS). 1980" reference is not in the Section 4.0 write-ups.
191	4-91	36-38	The "National Academy of Sciences (NAS). 1990" reference is not in the Section 4.0 write-ups.
192	4-82	7	The "National Environmental Policy Act of 1969" reference is not in the Section 4.0 write-ups.
193	4-82	36-38	The "Natural Heritage and Endangered Species Program (NHESP). 1995a" reference is not in the Section 4.0 write-ups.
194	4-83	37-38	The "Nuclear Regulatory Commission (NRC). 1987" reference is not in the Section 4.0 write-ups.
195	4-84	11-13	The "Nuclear Regulatory Commission (NRC). 1996b" reference is not in the Section 4.0 write-ups.
196	4-84	36-37	The "Nuclear Regulatory Commission (NRC). 2006b" reference is not in the Section 4.0 write-ups.

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#	Page	Line Number(s)	Comment
197	4-85	1, 6 – 7	Suggest adding a period after "2006c" to correct a typographical error. The "Old Colony Planning Council (OCPC). 2000" reference is not in the Section 4.0 write-ups.
198	4-86	1-2	The "United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000" reference is not in the Section 4.0 write-ups.
199	4-86	7-8	The "U.S. Census Bureau (USCB) 1991" reference is not in the Section 4.0 write-ups.
200	4-86	13-14	The "U.S. Census Bureau (USCB) 2001" reference is not in the Section 4.0 write-ups.
201	5-3	32	Suggest deleting "NRC 1996." Footnote on page 5-1 states that all GEIS references are to the GEIS and Addendum 1.
202	5-4	21	Suggest changing "(2006a)" to "(Entergy 2006a)" to reflect the listing in the Section 5.3 References.
203	5-5	6	Suggest changing SAMAs to SAMA.
204	5-6	30	Suggest changing "equivalents (person-rem)" to "equivalent man (person-rem)".
205	5-10	All	For consistency with the other sections suggest adding 10 CFR 50, 10 CFR 51, 10 CFR 54, 10 CFR 73 and 10 CFR 100 to the Section 5.3 References.
206	8-14	28	Suggest changing "(USEPA 2000b)" to "(EPA 2000b)" to reflect the listing the Section 8.4 References.
207	8-21	18-19	Need a space between Lines 18 and 19.
208	8-29	28	Suggest changing "powerbock" to "power block" to correct a typographical error.
209	8-29	29	Need a space above Line 29.
210	8-30	14	Need a space above Line 30.
211	8-30	18	Suggest changing "MODERATE" for Alternate Greenfield Site column to "SMALL to MODERATE" since Line 11 of Page 8-28 states "SMALL to MODERATE" for siting at PNPS or an Alternate Greenfield Site.
212	8-30	19	Need a space above Line 19.

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#	Page	Line Number(s)	Comment
213	8-37	21	Suggest changing "MODERATE" under the Impact Column to "SMALL to MODERATE" since Line 8 of Page 8-36 states "SMALL to MODERATE".
214	8-47	8	Suggest changing "powerbock" to "power block" to correct a typographical error.
215	9-10	17	Suggest changing "MODERATE" under Natural Gas-Fired Generation Alternate Greenfield Site column to "SMALL to MODERATE" since Line 11 of Page 8-28 states "SMALL to MODERATE" for siting at PNPS or an alternate Greenfield site".
216	9-10	19	Suggest changing "MODERATE" under the New Nuclear Generation Alternate Greenfield Site column to "SMALL to MODERATE" since Line 8 of Page 8-36 states "SMALL to MODERATE".
217	E		Appendix E has three subsections, all labeled Appendix E with no subsection designations. Two of these subsections use the same numbering scheme (e.g. Section 1.0 on Pages E-22 and E-51). The Appendix E subsections should have unique designators such that two different sections of the report do not have the same designator (e.g. Appendix E Section 1.0).
218	E-2	9 13	The current DOT registration number is No. 053006 550 005O. It was issued 5/30/2006 and expires 6/30/2007. The current Depredation Permit (#MB831184-0) was effective on 7/1/2006 and expires 6/30/2007.
219	E-3	12	The issue and expiration dates need to be updated for Materials License 49-0078. The current license was issued May 11, 2006 and expires May 31, 2011.
220	E-4	5	The issue and expiration dates need to be updated for South Carolina Radioactive Waste Transport Permit 0007-20-1. The current permit number is 0007-20-07-X, was issued 12/12/2006 and expires 12/31/2007.
221	E-4	11	The issue and expiration dates need to be updated for Tennessee Radioactive Waste License-for-Delivery T-MA004-L01. The current license number is T-MA004-L07, was issued 12/5/2006 and expires 12/31/2007.
222	E-15	30	Apparent error "disch temp diff. ranging from 33.8 – 48 degrees F ..." The typical temperature difference is 26 – 29 degrees F.
223	E-15	35	PNPS is not attempting "to offset adverse impacts" by stocking 25,000 winter flounder. It is a pilot program intended to determine the feasibility of this approach (which could be scaled up as needed).

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#	Page	Line Number(s)	Comment
224	E-26	9	Typo "1998 MWt" should be 2028 MWt.
225	E-28	41	There is no "ENSR 2002" listing in the Section 7.0 References.
226	E-29	30-32	Suggest changing the sentence "Since the chlorination events ...only one pump." to "Condenser chlorination is usually conducted only when both circulating water pumps are running."
227	E-32	11	There is no "BSC Group 1996" listing in the Section 7.0 References.
228	E-32	21-22	There is no "Entergy 2006a" listing in the Section 7.0 References.
229	E-32	22	There is no "AEC 1972" listing in the Section 7.0 References.
230	E-32	24	There is no "Entergy 2006a" listing in the Section 7.0 References.
231	E-32	29	There is no "Entergy 2006a" listing in the Section 7.0 References.
232	E-32	29-30	There is no "NSTAR 2006" listing in the Section 7.0 References.
233	E-32	31	There is no "NSTAR 2006" listing in the Section 7.0 References.
234	E-34	18	Suggest changing the first sentence of the paragraph to read as follows: "Water depths in the vicinity of PNPS are typically 10 ft and up to 120 ft fives miles offshore of the site."
235	E-34	22	There is no "ENSR 2002" listing in the Section 7.0 References.
236	E-34	28	There is no "EG&G 1995" listing in the Section 7.0 References.
237	E-34	28	There is no "ENSR 2002" listing in the Section 7.0 References.
238	E-34	30	There is no "ENSR 2002" listing in the Section 7.0 References.
239	E-34	37	There is no "ENSR 2002" listing in the Section 7.0 References.
240	E-34	40	There is no "ENSR 2002" listing in the Section 7.0 References.
241	E-37	19	Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 7.0 references, there is no "FWS 2006" listing only.

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#	Page	Line Number(s)	Comment
242	E-37	20	Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 7.0 references, there is no "FWS 2006" listing only.
243	E-37	23	Although there are "FWS 2006a" and "FWS 2006b" listings in the Section 7.0 references, there is no "FWS 2006" listing only.
244	E-43	20	Suggesting adding the clarification that no sturgeon of any type has ever been observed at PNPS; therefore, there has been no chance of mis-identification.
245	E-45	9-11	The "Fish and Wildlife Service (FWS) 2006e" reference is not in the Sections 1.0 – 6.0 write-ups (Pages E-22 through E-43).
246	E-45	32-34	The "Mass Audubon 2003" reference is not in the Sections 1.0 – 6.0 write-ups (Pages E-22 through E-43).
247	E-45	36-39	The "National Marine Fisheries Service (NMFS) 2002" reference is not in the Sections 1.0 – 6.0 write-ups (Pages E-22 through E-43).
248	E-47	18-19	This reference is incorrect. The referred to document is email correspondence between Jill Brochu at Entergy and Robert Prescott. It is not available at the location noted. Also Robert Preston is employed at the Massachusetts Audubon Society, not the Provincetown Center for Coastal Studies.
249	E-51	32	The "Endangered Species Act" should be listed in the Section 9.0 references to be consistent with other regulatory Acts listed in the Section 9.0 References.
250	E-52	38-39	Suggest changing the first sentence of the paragraph to read as follows: "Water depths in the vicinity of PNPS are typically 10 ft and up to 120 ft fives miles offshore of the site."
251	E-57	1	There is no "Lawton et al. 1995" listing in the Section 9.0 References.
252	E-57	38-39	The sentence "Debris and large, impinged organisms are removed from the bar racks using a mechanical rake." should be changed to read "Debris and large, impinged organisms are removed from the bar racks using divers." since the mechanical rake is not currently used.

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#	Page	Line Number(s)	Comment
253	E-60	17-20	The sentence "The mixture is used to ensure the total residual chlorine discharge concentration does not exceed a maximum daily concentration of 0.10 parts per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge." is incorrect. The Condenser Cooling Water NPDES Permit total residual chlorine limitations are "0.10" maximum daily and "0.1" average monthly. The Plant Service Cooling Water NPDES Permit total residual chlorine limitations are "1.0" maximum daily and "0.5" average monthly.
254	E-60	33-35	Suggest changing the sentence "Since the chlorination events ...only one pump." to "Condenser chlorination is usually conducted only when both circulating water pumps are running."
255	E-62	19-20	Based on the PNPS NPDES Permit and Table 2-2, there are no temperature limitations on the service water. Therefore, the sentence "The permitted change in temperature across the service water is 5 to 10°F." is incorrect and should be deleted. Also, suggest adding another space to separate the sentence from the next sentence.
256	E-63	13	There is no "BSC Group 1996" listing in the Section 9.0 References.
257	E-66	24	Suggest changing "Marine Research, Inc. 2005b" to "MRI 2005b" to be accurate with the listing in the Section 9.0 References.
258	E-66	41	Suggest changing "Marine Research, Inc. 2005b" to "MRI 2005b" to be accurate with the listing in the Section 9.0 References.
259			Comment number not used.
260	E-67	30	The "Clean Water Act" should be listed in the Section 9.0 references to be consistent with other regulatory Acts listed in the Section 9.0 References.
261	E-67	36	There is no "EPA 1994" listing in the Section 9.0 References.
262	E-68	34-35	The sentence states "Condenser tubes at PNPS are cleaned by backwashing on a 1 to 2-week interval, depending on the degree of bio fouling." is incorrect. Thermal backwashing is done 4 to 5 times per year. This process was accurately described on Page E-62, 3rd Paragraph, starting at Line 25.
263	E-73	19	There is no "NMFS 2005a" listing in the Section 9.0 References.
264	E-80	8	There is no "Steimle et al. 1999d" listing in the Section 9.0 References.

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#	Page	Line Number(s)	Comment
265	E-73	38-39	This comment is fully described in the Enclosure 2 comments.
266	E-74	1-5	This comment is fully described in the Enclosure 2 comments.
267	E-75	36-40	This comment is fully described in the Enclosure 2 comments.
268	E-77	33-34	This comment is fully described in the Enclosure 2 comments.
269	E-80	35	There is no "NMFS 2005c" listing in the Section 9.0 References.
270	E-81	26	There is no "Shepherd 2000b" listing in the Section 9.0 References.
271	E-81	32	There is no "Deuel 1964" listing in the Section 9.0 References.
272	E-85	8-9	Suggest changing "NOAA 1998a" to "NOAA 1998" to accurately reflect the listing in the Section 9.0 References.
273	E-89	1	Suggest changing "Normandeau 206b" to "Normandeau 2006b" to correct a typographical error.
274	E-89	5-10	This comment is fully described in the Enclosure 2 comments.
275	E-91	15	There is no "Bowman et al. 2000" listing in the Section 9.0 References.
276	E-98	35	Suggest changing "Pereira 1999" to "Pereira et al. 1999" to accurately reflect the listing in the Section 9.0 References.
277	E-96	37-40	This comment is fully described in the Enclosure 2 comments.
278	E-97	35-39	This comment is fully described in the Enclosure 2 comments.
279	E-99	24	Suggest changing "Scott 1982a" to "Scott 1982" to accurately reflect the listing in the Section 9.0 references.
280	E-99	8-13	This comment is fully described in the Enclosure 2 comments.
281	E-100	22-23	There is no "Burnett et al. 1992" listing in the Section 9.0 References.

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#	Page	Line Number(s)	Comment
282	E-101	26	Suggest changing "Cooper et a. 1998" to "Cooper and Chapleau 1998" to accurately reflect the listing in the Section 9.0 References.
283	E-102 E-105	Sections 7.0 and 8.0	The NRC is not known to have been delegated authority under the Clean Water Act to make recommendations regarding mitigation measures associated with "aquatic matters". In addition, 316(b) is associated with numerical performance standards and does not define "impact". Mitigation measures in the future, if any, will be developed and jointly agreed upon between EPA Region I and Entergy as part of the 316(b) compliance process. Therefore, Section 7.0 should be deleted.
284	E-103	37	There is no "Earth Tech 2006a" listing in the Section 9.0 References.
285	E-104	5	There is no "Siemens 2006" listing in the Section 9.0 References.
286	E-104	6	There is no "EPRI 2006" listing in the Section 9.0 References.
287	E-106	1-3	The "Able et al. 1982" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
288	E-107	20-22	The "Burnett et al. 1983" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
289	E-107	24	Suggest changing "2000a" to "2000" to correct a typographical error and so that the reference is consistent with what is shown in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
290	E-108	11-16	The "Cargnelli et al. 1999f" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
291	E-108	35-37	The "Chang et al. 1999c" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
292	E-109	38	Suggest changing "1988a" to "1998" to correct a typographical error so that the reference is consistent with that shown in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
293	E-110	1-2	The "Dooley 1978" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
294	E-110	31-33	The "Fahay et al. 1999b" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).

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#	Page	Line Number(s)	Comment
295	E-110	35-37	The "Freeman and Turner 1977" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
296	E-111	1-2	Suggest listing all authors for this reference instead of only "Galya et al. 1997" to be consistent with other sections References.
297	E-111	10-12	The "Grimes et al. 1986" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
298	E-112	1-5	The "Hendrickson and Holmes 2004" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
299	E-112	21	Suggest changing "1999a" to "1999" to correct a typographical error and to be consistent with how the reference is shown in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
300	E-112	29-30	The "Kelly and Barker 1961a" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
301	E-112	32-33	The "Kelly and Barker 1961b" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
302	E-113	26-29	The "Lawton et al. 1984" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
303	E-114	33-34	The "Marak 1967" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
304	E-114	36-27	The "Marak 1973" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
305	E-115	1-4	The "Marine Research, Inc. (MRI) 2005a" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
306	E-115	6	Suggest inserting "(MRI)" between "Inc." and "2005b" to correct a typographical error and to be consistent with how the reference is shown in Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
307	E-115	11-14	The "Marine Research, Inc. (MRI) 2006" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).

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#	Page	Line Number(s)	Comment
308	E-118	19-21	The "Pikanowski et al. 1999" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
309	E-118	23	Suggest changing "1999a" to "1999" to correct a typographical error and to be consistent with how the reference is shown in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
310	E-120	1-3	The "Steimle et al. 1999e" reference is not in the Sections 1.0 – 8.0 write-ups (Pages E-51 through E-105).
311	G-1	20	Remove ":"
312	G-4	6	Suggest changing "(NRC 1997b)" to "(NRC 1997a)".
313	G-4	9	Suggest changing "equivalents (person-rem)" to "equivalent man (person-rem)".
314	G-8	25	Suggest inserting "(Entergy 2006b)" after "was evaluated."
315	G-9	16, 21	Suggest inserting "Exchanger Room" after "Heat".
316	G-12	29	Suggest changing "w" to "was".
317	G-13	2	Suggest changing "one percent increase" to "two percent increase".
318	G-13	14	There is no "USDA 1998" listing in the Section G.8 references (Pages G-38 through G-40).
319	G-16	9	Suggest inserting "(Entergy 2006b)" after "potential SAMAs."
320	G-16	10	Suggest inserting "components" after "rugged".
321	G-16	13-14	Suggest deleting the sentence "One block wall included in the list of important faults has a conservatively determined capacity of 1.06 g." This information was not included in reference Entergy 2006b and does not belong in this paragraph.
322			Comment number not used.
323	G-23	12-14	Suggest deletion of "are completely eliminated" from assumptions statement since it is redundant.

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#	Page	Line Number(s)	Comment
324	G-28	25	Suggest adding "benefits and" prior to "costs" since the response to RAI 5.e changed both the benefits estimate and the cost for SAMA 27.
325	G-32	23	Suggest changing "$4.5M" to "$4.6M" since $914,000 x 5 = $4,570,000.
326	G-40	24-25	The "Nuclear Regulatory Commission (NRC) 2003" reference is not in the Sections G.1 – G.7 write-ups (Pages G-1 through G-38).

ENCLOSURE 2 to Letter 2.07.017
(16 pages)

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2.0 Plant Interaction with the Environment

Page 2-68, lines 9-21: This paragraph provides various statements about winter flounder stock and attempts to offer related data from different times and locations, apparently to provide a basis for drawing conclusions about the status of the 'Gulf of Maine stock'. However, much of the information presented is not truly relevant, and it oversimplifies the question of regional winter flounder abundance. Rather than citing references used to manage fishing limits across the entire Gulf of Maine, it is more appropriate that the report focus on abundance indicators that most closely reflect the status of winter flounder in the area of Cape Cod Bay, for example, the most recent (2006) data from PNPS's annual 'Area Swept' abundance estimates. The references that rely on commercial landings, and which discuss the degree of 'exploitation' or 'overfishing' are biased by factors unrelated to the number of fish present, and may be more reflective of changes in the level of fishing effort or catch restrictions over the time period. There are numerous variables that affect efforts to estimate winter flounder abundance, many of which have not been reliably quantified or standardized. Those statistics obtained from the fishing industry should be omitted or given less credence than information collected using scientifically approved methods.

Page 2-68, lines 23-29: states "... *data from the local population ...indicate that the annual abundance estimates of winter flounder in western CCB continue to decline (Figure 2-8).*" This sentence implies that the "trends" from the prior paragraph are not matched by the abundance estimates in the vicinity of PNPS. This is an erroneous conclusion for two reasons: 1] it is an incorrect inference from the data in Figure 2-8 (PNPS's annual 'Area Swept' monitoring effort), and 2] it falsely presumes that the information given in the first paragraph constitutes evidence that a 'trend' is present in the Gulf of Maine winter flounder abundance data (see comment above). Simply because the 2005 winter flounder collection numbers were the smallest catch over the time series does not mean there is a declining trend (based on the three previous years). In fact, the number of sub-adult winter flounder collected in the most recent 'Area Swept' survey increased substantially. The 2006 estimate of immature winter flounder (total length less than 280 mm) was the fourth highest over the 12-year series, indicating that a healthy level of recruitment continues to occur in the vicinity of PNPS (see Figure 1 on the following page). Given that fish populations will often exhibit substantial variations as a natural consequence of environmental factors, the fluctuations observed over the 12-year history of the 'Area Swept' winter flounder abundance monitoring do not constitute a declining trend.

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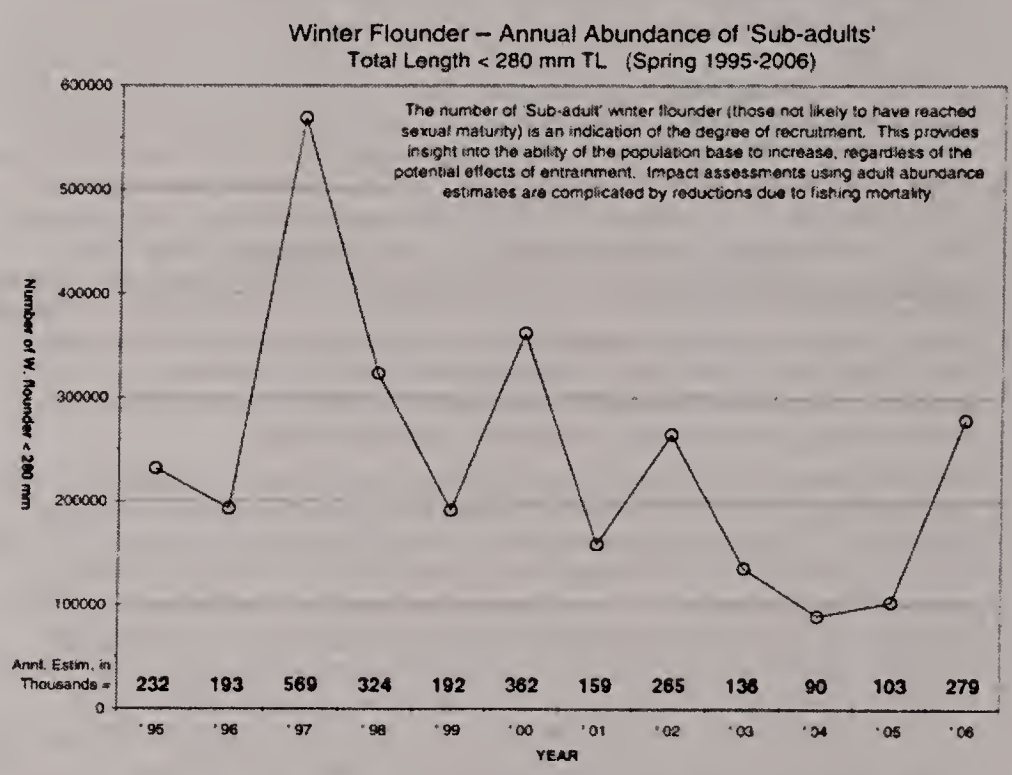

Figure 1: Winter Flounder – Annual Abundance of Sub-adults

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4.0 Environmental Impacts of Operation

Page 4-21, lines 27–28: *"...there were several methodological difficulties, which impart a high degree of uncertainty to these estimates."* The Larval Transport Studies provide a direct method of measuring 'percent entrainment' of winter flounder at PNPS using larval densities from the plant and from Cape Cod Bay, obtained simultaneously. The obvious benefit to this approach is that it eliminates the reliance on hypothetical models (and their inherent uncertainties) and instead, uses real time field data collected at the site. The key challenge is to ensure that using a net to sample larvae close to the bottom (larval stages 3 and 4) does not underestimate the actual number of larvae present in the bay. As with many field studies, new techniques were employed to address this difficulty and they were not completely successful.

There was no problem with the stage 3 and 4 larval densities obtained from sampling in the discharge canal, which collects all larval stages with equal efficiency. To determine 'percent entrainment' these values were then divided by the number sampled in the bay. As a result, it was apparent that the few elevated entrainment values for stage 3 and 4 larvae obtained in 2002 and 2004 were due to low numbers of stages 3 and 4 collected in the bay (i.e. under sampling larvae close to the bottom). However, this discrepancy does not cause *a high degree of uncertainty* and it does not detract from the key conclusion that the amount of winter flounder larvae in northwest Cape Cod Bay entrained by PNPS is estimated (from direct measurement) to be less than 1% of the net larval transport.

Page 4-23, Line 42; Page 4-24, Lines 1-3: states *"Based on the decline of the local population, their percentage take of the local population, and the considerable uncertainties in the stock status, the staff's conclusion is that continued operation of PNPS would have a MODERATE impact on the local winter flounder population due to entrainment over the course of the license renewal term."*

NRC's draft conclusion was apparently based on a comparison between numbers of equivalent adults (EA) and numbers of fish estimated with an area swept trawl study. The equivalent adult methodology is a common screening tool that relies on fixed estimates of egg and larval survival rates to predict how many adults might be expected to result from a particular number of eggs and larvae. Applied to numbers of eggs and larvae entrained by a circulating water system such as at PNPS, the methodology provides one way of understanding the significance of what at first may appear to be large numbers of individual eggs and larvae. Introduced by Horst (1975) the methodology was developed by Goodyear (1978), Saunders (1978), Boreman et al. (1981) and Saila et al. (1997). "The equivalent adult methodology provides little insight into the long term viability of the affected populations and should be used only to obtain a first approximation of the severity of potential losses." (Goodyear 1978).

Unfortunately, determining the survival rate of fish eggs and larvae in the real world is very difficult to do. Rates are very small numbers because most fish eggs and larvae do not survive. They are highly variable from one year to the next if not from day to day, and rarely available for specific populations of fish. As a result, survival rates obtained from the scientific literature are almost always from geographical areas other than the Station being studied and not uncommonly from different species. Small variations in the estimated survival rates result in dramatic changes in the EA values. Recognizing

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the uncertainty inherent in the EA model, egg and larval rates for winter flounder in the PNPS area for use in the EA model were obtained from three sources and the resulting values averaged (Normandeau 2006).

Historically, equivalent adult estimates for winter flounder at PNPS were small particularly when compared with numbers landed by fishermen. The relatively high EA values in 4 of the 26 years examined (1997, 1998, 2004 and 2005) likely reflect years when natural egg and larval survival rates were relatively high and exceptional numbers of winter flounder eggs and/or larvae survived the early life history stages. PNPS operations did not change during those years in any way that could result in increased entrainment and there is no reason to believe that circulating water patterns in Cape Cod Bay varied in a way that would result in a disproportionate level of entrainment.

As a result of the uncertainties in early life history stage survival rates and the EA values obtained in 1997 and 1998, a three-year larval transport study was completed to directly measure the number of larval winter flounder drifting past PNPS. Field collections of winter flounder were made at a series of stations in Cape Cod Bay as well as in the PNPS discharge. Bottom and boat mounted acoustic Doppler current profilers were deployed to directly measure water velocity and direction in conjunction with the plankton samples.

Significant conclusions of the larval transport study were:

- There is a consistent net flow of winter flounder to the south along coastal Cape Cod Bay in the vicinity of PNPS.
- A very small amount – less than 0.1% -- of the net volumetric flow of water in Cape Cod Bay passes through PNPS.
- The amount of winter flounder larvae in northwest Cape Cod Bay that is entrained by PNPS is conservatively estimated at less than 1% of the net larval transport.

The larval transport study provides the best estimate of entrainment losses at PNPS. Consistent with the empirical transport model used extensively to assess impacts on the Hudson River and other large rivers systems (Boreman et al. 1978, 1981, Boreman and Goodyear 1988) it represents a direct comparison of numbers entrained with numbers available to be entrained. The methodology does not require the assumptions about survival rates of larvae that are historically difficult if not impossible to measure and are required for the EA model.

Winter flounder stock assessment data from the Massachusetts Division of Marine Fisheries indicate that abundance remains at historically low levels south of Cape Cod. The Massachusetts Division of Marine Fisheries Region 4 and 5 data for north of Cape Cod however has ranged from 10 to 35 kg per tow between 1978 and 2004 varying without trend over the time series. NRC noted that the National Marine Fisheries Service Gulf of Maine time series declined in 2003 and 2004 (lines 6-8, page 4-23) the last two years available at the time the document was prepared. Catch per unit effort increased in 2005 and 2006, thus the time series has also varied without trend from 1979 to 2006 ranging between 2 and 12 fish per tow.

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Additional information currently available also suggests that the winter flounder population in the Cape Cod Bay area is not in a downward trend. Beach seine sampling in Plymouth Harbor completed in conjunction with Entergy's young winter flounder hatchery release program indicate that numbers of young, wild fish remain strong and in fact have increased over the past two years (see Figure 2 below). It is also interesting to note that numbers of young fish collected during the summer do not appear to be correlated with the number of larvae entrained at PNPS the previous spring. This local field data suggest that numbers of winter flounder entrained do not translate into reduced numbers of young fish.

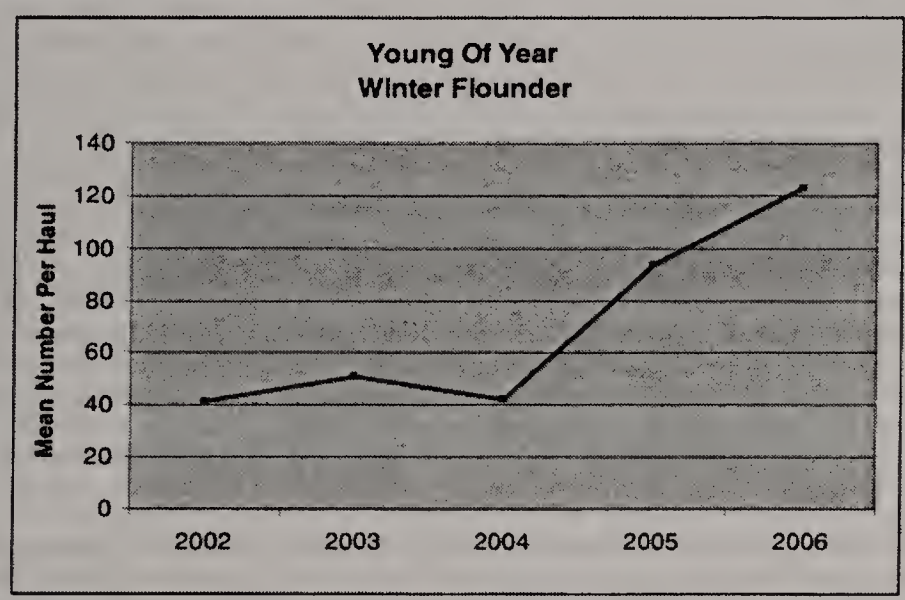

Figure 2: Mean numbers of wild young of year winter flounder collected by 100-ft beach seine in Plymouth Harbor (during the month of July) from 2002-2006.

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Appendix E Pilgrim Nuclear Power Station
Compliance Status and Consultation Correspondence

Page E-73, Line 38-39: The DSEIS states "*Eggs and larvae of the American plaice dominated entrainment studies at PNPS...*"

As widely reported in the fisheries literature adult and juvenile American plaice prefer moderately deep water and are found near shore only in colder waters in the northern Gulf of Maine approximately 250 miles north of Pilgrim Nuclear Power Station (PNPS) and on northward to Newfoundland and Greenland (Collette and Klein-MacPhee 2002). "Adults have never been caught in less than 18 m of water in the Gulf of Maine, and their preferred depth off the coast of Maine is 100-119 meters" (Sherman et al. 1993). This is far deeper than the 5 to 10 meter depths near PNPS. This reported distribution is consistent with local collections conducted by the Massachusetts Division of Marine Fisheries as no American plaice were taken in 13 years of their bottom trawl survey in the waters around PNPS (1970 – 1982; Lawton et al. 1995). The Division of Marine Fisheries completed 1,322 trawl tows over that period of time using methods and equipment that would have been expected to capture American plaice were they present in the area. Plaice also were only rarely collected in more recent intensive spring bottom trawl sampling around PNPS from 1995 through 2006 and only two individuals were impinged at PNPS in the 27 years between 1980 and 2006 (Normandeau 2006). These data strongly suggest that PNPS is not located within essential fish habitat for adult and juvenile plaice.

The DSEIS suggests that American plaice eggs dominate entrainment studies at PNPS. This statement represents a misunderstanding of the PNPS entrainment data. Plaice spawn pelagic eggs primarily between March and May at a time of year when most fish spawn demersal adhesive eggs. They therefore account for a relatively high percentage of fish eggs only at that time of year although small numbers of them are entrained; typical monthly mean densities average less than 3 eggs per 100 m^3 of water. To state that eggs and larvae of the American plaice dominated entrainment studies at PNPS is misleading since such densities are small, particularly when compared to species that produce pelagic eggs at other times of the year.

The DSEIS also states that American plaice larvae dominate entrainment studies at PNPS. This is incorrect. Thirteen species of fish larvae typically account for 95% of the larvae entrained at PNPS on an annual basis and plaice is not included among those species. Monthly mean densities typically range between 0.1 and 2.1 larvae per 100 m^3 of water during months when they occur at all and they occur only during the months of March through August when several years are considered together. In 2004, for example, they appeared only in April and May.

Finally, irrespective of the numbers of American plaice eggs and larvae collected at PNPS, entrainment of American plaice egg and larval life stages represents a mere fraction of those life stages present in the larger pool of plaice distributed throughout the Gulf of Maine and Georges Bank, not from a localized population inside Cape Cod Bay (ENSR 2000). Ichthyoplankton collections from Cape Cod Bay (Scherer 1984) indicate that early stage American plaice eggs are most common at the mouth of the Bay well to the north of PNPS and consistent with their preference for colder, northern waters. For these reasons, it is unlikely that the continued operation of PNPS, including entrainment

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of American plaice eggs and larvae, will have a 'substantial adverse effect' on the essential fish habitat of this species.

Page E-74, Lines 1-5: states *"Continued operation of PNPS may also have the potential to affect prey items of various life stages of the American plaice either through entrainment of phytoplankton, zooplankton, or ichthyoplankton, or via impingement of small forage fish species."*

The National Marine Fisheries Service designates essential fish habitat using 10 minute squares of latitude and longitude. The size of each block varies with latitude but they are approximately 10 nautical miles on each side or approximately 100 square nautical miles in area. Such large blocks of habitat are of limited consequence in the open ocean but in coastal areas like Plymouth near shore blocks are designated as EFH even though a species preferred habitat is in deep water well removed from shore. That is notably the case for American plaice, which are rarely found in the immediate vicinity of PNPS because their habitat preference is moderately deep water. They utilize relatively shallow water only in the northern Gulf of Maine, Newfoundland and Greenland (Sherman et al. 1993, Collette and Klein-MacPhee 2002). Fisheries studies around PNPS as well as entrainment sampling at the site support these observations.

The diet of the juvenile and adult life stages of American plaice consists of a wide variety of invertebrate taxa, particularly benthic invertebrates including brittle stars, sand dollars, polychaetes, shrimp, and bivalves (Bowman et al. 2000). American plaice are opportunistic feeders – "They prey on practically any bottom-living animals that are small enough for them to devour" (Collette and Klein-MacPhee 2002). Their diet varies and shifts over time in response to relative abundance of prey items and to where they are located. For example, in southern New England they eat large quantities of amphipods, *Crangon* shrimp, polychaetes, and bivalves while on Georges Bank they consume primarily star fish, brittle stars, and sand dollars (Collette and Klein-MacPhee 2002). They occasionally eat small fish such as sand lance (Pitt 1967) but that does not appear to be an important part of their diet.

The primary contributors to the diet of American plaice are not directly affected by impingement at PNPS because many of the invertebrates they prey upon occur on the bottom where they are not subject to impingement. It is unlikely that they would be indirectly affected by entrainment of planktonic organisms such as phytoplankton and zooplankton that provide food for larger invertebrate prey – studies have shown that these lower trophic level organisms typically survive entrainment. At PNPS "the combined effects of heat and chlorine had no effect on survival rates" of entrained phytoplankton at temperatures below 17C (Bridges and Anderson 1984). The majority of productivity studies with entrained phytoplankton at PNPS indicated that productivity increased following entrainment (MRI 1978). Studies at other New England power stations indicate that the ability of phytoplankton to carry out photosynthesis is not adversely affected by entrainment (MRI 1980). Zooplankton entrained at PNPS generally showed high survival rates ranging from 95% to 100% at most operating conditions (Bridges and Anderson 1984). Ichthyoplankton have also been widely shown to survive entrainment by circulating water systems at power stations including PNPS (MRI 1978, 1982, Ecological Analysts 1981, EPRI 2000, LMS 2001). In any event, neither entrainment, nor impingement results in the removal of plants and animals from the ecosystem. Thus, even those plants and animals that do not survive passage through the Station settle to the bottom where they provide food for benthic invertebrates that in turn provide food for American plaice.

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Based upon the information above, continued operation of PNPS will not have a 'substantial adverse effect' on the essential fish habitat of the American plaice. Thus, it is erroneous for the DSEIS, in Appendix E, to suggest a potential food web or habitat impact. Plaice frequent deep water well removed from PNPS, their food supply is diverse and unlikely to be affected either directly or indirectly by entrainment or impingement.

Page E-75, Lines 36–40: states *"Continued operation of PNPS may also have the potential to affect prey items of juvenile and adult life stages of the Atlantic cod as several prey items of the Atlantic cod (sand lance and herring) have been commonly reported in the impingement and entrainment sampling program at PNPS."*

The National Marine Fisheries Service designates essential fish habitat using 10 minute squares of latitude and longitude. The size of each block varies with latitude but they are approximately 10 nautical miles on each side or approximately 100 square nautical miles in area. Such large blocks of habitat are of limited consequence in the open ocean but in coastal areas like Plymouth near shore blocks are designated as EFH even though a species preferred habitat is in deep water well removed from shore. That is notably the case for Atlantic cod. Cod juveniles and adults are typically found in deeper waters further offshore than those around PNPS (Collette and Klein-MacPhee 2002). While young fish are more common in coastal waters they move to deeper waters as they age and mature (Cote et al. 2003). This information is supported by the 13-year trawl survey conducted by the Massachusetts Division of Marine Fisheries from 1970 to 1982 (Lawton et al. 1995); cod were not among the top six taxa accounting for the majority of the catch in 1,322 bottom samples.

Regardless, diet of juvenile and adult Atlantic cod has been extensively studied throughout its range and they are known to eat a broad array of taxa (see for example Bowman et al. 2000, Collette and Klein-MacPhee 2002, Link and Garrison 2002). Their diet varies and shifts over seasons and years in response to relative abundance of prey items. For example, "Cod will pursue and gorge on squids anytime they are available." and "Any shellfish a cod encounters that can be swallowed whole is likely to be consumed." (Collette and Klein-MacPhee 2002). Fish, crabs, lobster, shellfish such as scallops, mussels and clams, squid, sea stars, sea urchins, sea cucumbers, and shrimp are readily found in their stomachs. While fish are most often encountered in their stomachs they feed on a wide variety of species including Atlantic herring, Atlantic mackerel, sand lance, silver hake, redfish, and flounder.

The DSEIS states that continued entrainment and impingement of sand lance and herring will have a 'substantial adverse effect' on the essential fish habitat of the Atlantic cod. Sand lance eggs are not entrained at PNPS because they are demersal and adhere to the bottom. Atlantic herring eggs are not entrained at PNPS because they are demersal and adhere to the substrate when spawned. While herring larvae are entrained they originate primarily outside Cape Cod Bay and those entrained originate from a large pool of larvae distributed throughout the Gulf of Maine and Georges Bank and not a localized population (ENSR 2000, Normandeau 2006). Assessment of the potential effects of larval entrainment indicate that equivalent adult losses amount to about 0.007% of the regional spawning stock biomass. While herring are impinged on the PNPS intake screens the annual estimated number averages only 1,179 fish (1980-2004, Normandeau 2006). Sand lance are also occasionally impinged but they are uncommon, an annual average of only 53 fish being recorded over the 1980-2005 time period (Normandeau 2006).

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Fish and invertebrates entrained and impinged on the intake screens at PNPS are not removed from the near shore waters of northwestern Cape Cod Bay. Small organisms that do not survive drift to the bottom where they contribute to the nutrition of local benthic organisms. Larger animals that may not survive entrainment or impingement are still consumed by scavengers such as crabs, lobsters, and fish; these in turn can be eaten by any cod that stray in the vicinity of PNPS. It is unlikely therefore that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species.

Page E-77, Lines 33–34: states *"Continued operation of PNPS may also have the potential to affect prey items of adult mackerel as several of its prey items (small squid and fish eggs) are commonly reported in the impingement and entrainment sampling program at PNPS."*

Atlantic Mackerel adults are rarely found in the vicinity of PNPS since they are "fish of the open sea" and not "directly dependent either on the coastline or on the bottom in any way at any stage in their lives" (Collette and Klein-MacPhee 2002). Estimated total numbers impinged annually total five individuals over the 1980-2005 time period consistent with their preference for open ocean.

The DSEIS suggests that essential fish habitat for adult mackerel will be adversely affected by PNPS because squid and fish eggs are entrained and impinged. That conclusion is unrealistic because adult Atlantic mackerel consume a wide variety of prey including euphausiid, pandalid, and crangonid shrimp, arrow worms or chaetognaths, pelagic polychaetes, squid, copepods, amphipods, and a variety of fish species (Bowman et al. 2000, Collette and Klein-MacPhee 2002). They are opportunistic feeders -- "Practically all floating animals that are neither too large nor too small regularly serve to nourish mackerel" (Collette and Klein-MacPhee 2002).

Squid are impinged at PNPS but the annual number is not large. The estimated annual average number of squid impinged was only 81 animals over the 26-year period from 1980 – 2005. Squid spawn year round, grow rapidly, and are short lived (Cadrin 2000). Therefore, the impingement of small numbers of these animals is not expected to impact the food supply for mackerel. Fish eggs are entrained at PNPS and many of them are expected to survive (MRI 1978, 1982, Ecological Analysts 1981, EPRI 2000, LMS 2001). In any event, neither entrainment nor impingement results in the removal of plants and animals from the ecosystem. Thus, even those plants and animals that do not survive passage through the PNPS circulating water system remain available as food for other animals that are known to become prey for adult mackerel.

Based on the wide geographical range of adult mackerel, their primarily offshore distribution and varied diet, it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species.

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Page E-89, Lines 5–10: states *"Continued operation of PNPS may also have the potential to affect prey items of various life stages of the red hake, as several prey items of the red hake (zooplankton, squid, herring, flatfish species, and mackerel) have been commonly reported in the impingement and entrainment sampling program at PNPS."*

Red hake like Atlantic cod frequent deeper waters further offshore than those around PNPS. This is supported by the 13-year trawl survey conducted by the Massachusetts Division of Marine Fisheries (Lawton et al. 1995). Red hake were not among the top six taxa collected in that study that involved 1,322 bottom tows between 1970 and 1982. Red hake also prefer softer bottoms composed of mud and sand (Collette and Klein-MacPhee 2002) than is prevalent around PNPS.

Red hake larvae, juveniles and adults are opportunistic feeders that prey on a wide variety of taxa (Luczkovich and Olla 1983, Bowman et al. 2000). Their prey changes seasonally and throughout their life history (Steimle et al. 1999). Larval red hake prey on copepods and other microcrustaceans, whereas juveniles consume chaetognaths (arrow worms) and small benthic and pelagic crustaceans including amphipods, decapods, mysids, euphausiids, and copepods. Adult red hake prey on crustaceans, an assortment of fish species such as haddock, silver hake, sand lance and mackerel, and squid (Steimle et al. 1999). The dominance of these prey items changes seasonally, for example "Copepods are important in the fall and winter; arrow worms are eaten in the spring and summer" (Collette and Klein-MacPhee 2002).

It is unlikely that red hake would be indirectly affected by entrainment of planktonic organisms such as zooplankton that provide food for larger invertebrate prey and small fish – studies have shown that these lower trophic level organisms typically survive entrainment. In studies at PNPS zooplankton entrained generally showed high survival rates ranging from 95% to 100% at most operating conditions (Bridges and Anderson 1984). Larger invertebrates like squid are impinged at PNPS but the annual number is not large. The estimated annual average number of squid impinged is only 81 animals over the 26-year period from 1980 – 2005. Squid spawn year round, grow rapidly, and are short lived (Cadrin 2000). Therefore the impingement of small numbers of these animals is not expected to impact the food supply for red hake.

Atlantic herring eggs are not entrained at PNPS because they are demersal and adhere to the substrate when spawned. While herring larvae are entrained they originate primarily outside Cape Cod Bay and those entrained originate from a large pool of larvae distributed throughout the Gulf of Maine and Georges Bank and not a localized population (ENSR 2000, Normandeau 2006). Assessment of the potential effects of larval entrainment indicate that equivalent adult losses amount to about 0.007% of the regional spawning stock biomass. While herring are impinged on the PNPS intake screens the annual estimated number averages only 1,179 fish (1980 – 2004, Normandeau 2006).

Atlantic mackerel eggs and larvae are entrained by the circulating water system and juveniles and adult are occasionally impinged on the intake screens at PNPS. Analyses suggest that the number of age-1 fish that might reasonably be expected to result from the numbers of eggs and larvae entrained had they all died are equivalent to 0.2% of the local mackerel landings. Ichthyoplankton have also been widely shown to survive entrainment by circulating water systems at power stations including PNPS (MRI 1978, 1982, Ecological Analysts 1981, EPRI 2000, LMS 2001). Atlantic mackerel are swift

swimmers and they are not often impinged at PNPS. They occurred in samples during only six years from 1980 – 2005 with an average of five individuals annually. In any event, neither entrainment, nor impingement results in the removal of plants and animals from the ecosystem. Thus, even those plants and animals that do not survive passage through the Station settle to the bottom where they provide food for benthic invertebrates that in turn provide food for red hake.

Based on their preference for deeper waters and soft bottom and varied diet it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of red hake.

Page E-96, Lines 37–40: states *"Continued operation of PNPS may also have the potential to affect prey items of adult whiting, as several prey items of the whiting (small fish and squid) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations may have a substantial adverse effect on EFH for the whiting."*

Whiting or silver hake are a wide ranging species utilizing the entire water column over the course of the day. They are not among the more abundant species of fish eggs and larvae entrained at PNPS and they appear on the intake screens only sporadically. Silver hake eggs were collected each year from 1999 to 2006; however, they were one of fourteen species that contributed less than 1% to the annual egg collections during these years. Larvae were collected in 1999 to 2003, 2005, and 2006; however, they were one of thirty-eight species that contributed at most 7% to the annual larvae collections during these years (Normandeau 2006). Numbers of silver hake impinged annually averaged only 35 fish between 1980 and 2006 (Normandeau 2006). These observations are consistent with the reported distribution of the species which includes North American continental shelf waters from North Carolina to Newfoundland (Bigelow and Schroeder 1953) and suggest that silver hake are not in any way localized around PNPS.

The DSEIS suggests that whiting essential fish habitat will be adversely affected by PNPS because small fish and squid are entrained and/or impinged. This is unreasonable because adult and juvenile silver hake prey on a wide variety of taxa including many species of fish such as anchovies, hake, herring, mackerel, menhaden, alewives, sand lance, and silversides. They also feed on crustaceans and squid (Bowman et al. 2000, Collette and Klein-MacPhee 2002). They are opportunistic feeders and their diet varies with season and location (Lock and Parker 2004).

There is no information available on entrainment of small squid at PNPS. Larger juvenile and adult individuals are impinged at PNPS but the annual estimated total is not large. The estimated annual number of squid impinged averaged 81 over the 26-year period from 1980 – 2005. Squid spawn year round, grow rapidly, and are short lived (Cadrin 2000) therefore impingement of such a small number of animals is not expected to affect the ability of silver hake to find adequate food. Very small fish are entrained by the circulating water system at PNPS but they have also been widely shown to survive entrainment by circulating water systems at other power stations (Ecological Analysts 1981, EPRI 2000, LMS 2001). Small fish are also impinged on the intake screens at PNPS but many of them have been shown to survive (MRI 1984, Normandeau 2006). In any event, neither entrainment, nor impingement results in the removal of animals from the ecosystem. Thus, even those animals that do not survive passage through the

Station's circulating water system remain available as food for other animals that are known to become prey for adult whiting.

Based on their wide geographical range and varied diet and given that prey are not removed as a result of entrainment and impingement it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species.

Page E-97, Lines 35–39: states *"Continued operation of PNPS may also have the potential to affect prey items of the windowpane flounder, as one of its prey items (small fish) has been commonly reported in the impingement and entrainment sampling program at PNPS."*

The DSEIS suggests that windowpane essential fish habitat will be adversely affected by continued operation of PNPS because small fish are entrained and/or impinged. This is unlikely because windowpane are widely distributed over muddy sediments throughout the Gulf of Maine (Chang et al. 1999) and juveniles and adults are opportunistic feeders. They prey on a wide variety of taxa consisting chiefly on fish but also crustaceans. They also consume an assortment of other taxa including arrow worms, squids, mollusks, and polychaetes (Bowman et al. 2000).

Very small fish are entrained by the circulating water system at PNPS but they have been widely shown to survive entrainment by circulating water systems at other power stations (Ecological Analysts 1981, EPRI 2000, LMS 2001). Small fish are also impinged on the intake screens at PNPS but many of them have been shown to survive (MRI 1984, Normandeau 2006). In any event, neither entrainment nor impingement results in the removal of animals from the ecosystem. Thus, even those animals that do not survive passage through the Station's circulating water system remain available as food for other animals that are known to become prey for windowpane.

Based on their ubiquitous distribution throughout New England waters and their varied diet and given that prey biomass is not removed as a result of entrainment and impingement it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of windowpane.

Page E-99, Lines 8–13: states *"Continued operation of PNPS may also have the potential to affect prey items of the winter flounder, as they have been described as omnivores preying on a variety of fish and invertebrate species, many of which have been commonly reported in the impingement and entrainment sampling program at PNPS."*

Winter flounder is a widely distributed species that is found over a variety of sediment types including mud, sand, cobble, and rocks (Pereira et al. 1999). They are among the more abundant larvae entrain at PNPS and typically occur on the intake screens (mean occurrence of 917 fish from 1980-2004; Normandeau 2006).

Winter flounder are opportunistic feeders that prey on a wide variety of taxa. Larvae feed on abundant forms of phytoplankton and zooplankton such as diatoms, rotifers, dinoflagellates, and copepods (Pearcy 1962, Klein-MacPhee 1978, MRI 1979, 1983). Juveniles are "euryphagus"; 27 organisms representing 7 phyla having been identified in their stomachs by Pearcy 1962 (see also Klein-MacPhee 1978). Adult winter flounder are described as omnivorous "eating whatever is available" (Klein-MacPhee 1978).

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Chief prey items include polychaete worms, anthozoans, isopods and amphipod shrimp. They also prey on small crabs, squid, bivalves and other taxa small enough to be consumed with their small mouth (Bowman et al. 2000). MacPhee (1969) reported that the most important category of food in a winter flounder's diet depends on the type of bottom on which a fish resides.

The DSEIS suggests that winter flounder essential fish habitat will be adversely affected by continued operation of PNPS because a variety of fish and invertebrate species are entrained and/or impinged. This is unreasonable because all life stages of winter flounder are opportunistic feeders that prey on a wide variety of taxa. It is unlikely that flounder would be directly or indirectly affected by entrainment of planktonic organisms such as phytoplankton and zooplankton – studies have shown that these lower trophic level organisms typically survive entrainment. Zooplankton entrained at PNPS generally showed high survival rates ranging from 95% to 100% at most operating conditions (Bridges and Anderson 1984). Very small fish are entrained by the circulating water system at PNPS but they have been widely shown to survive entrainment by circulating water systems at other power stations (Ecological Analysts 1981, EPRI 2000, LMS 2001). Small fish are also impinged on the intake screens at PNPS but many of them have been shown to survive (MRI 1984, Normandeau 2006). In any event, neither entrainment nor impingement results in the removal of animals from the ecosystem. Thus, even those animals that do not survive passage through the PNPS circulating water system remain available as food for flounder as well as other animals that are known to become prey for winter flounder.

Based on their wide geographic range and varied diet and given that prey are not removed as a result of entrainment and impingement it is unlikely that the continued operation of PNPS will have a 'substantial adverse effect' on the essential fish habitat of this species.

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PNPS-D-NN

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Re: Public Comment NUREG-1437, Supplement 29

Summary of Comment
As soon as the best method can be determined, and prior to any extension of permit or license for operation, the salt water intake and discharge for the once-through cooling system at Pilgrim Nuclear Power Station must be retrofitted to avoid if possible, and mitigate as necessary, adverse impacts to the aquatic populations of Cape Cod Bay and its estuarine systems. The SEIS and other reports describe impingement and entrainment of aquatic life forms at levels that adversely impact the Cape Cod Bay Sanctuary through unacceptable reduction in fish populations, especially populations of Rainbow smelt, Alewife, Blueback herring, winter flounder, Atlantic mackerel, Atlantic cod, and other fish important to the ecosystem function and balance of the bay as a whole, and to the Jones River in particular.

Background of Commenter
Jones River Watershed Association [JRWA] is a Kingston based non-profit citizen group that advocates for the waters, natural habitats and environmental resources of the Jones River and Cape Cod Bay ecosystem. The group was established in 1985 to address impacts from the diversion of the Jones River headwaters, Silver Lake, by the City of Brockton for water supply, and years later expanded its mission to include protection and restoration of the natural resources of Cape Cod Bay. In 2003 JRWA established Jones River Landing Environmental Heritage Center in the Jones River estuary in order to provide education and long term stewardship of the aquatic resources of Jones River and Cape Cod Bay. A primary goal is to reestablish the Alewife and Blueback herring run throughout the Jones River to enable their spawning in Silver Lake, and to improve habitat conditions in the Jones River for native and diadromous fish species including Rainbow smelt, Alewife and Blueback herring, American and Hickory Shad, White perch, American eel and others. To accomplish this we address stream flow issues, water quality, habitat degradation, stormwater management, and provide volunteer monitoring for certain species which at this time include the river herring, smelt and juvenile American lobster. We have also conducted macroinvertebrate and fish inventories in the river system. We work cooperatively with the Massachusetts Riverways Program, State Division of Marine

Fisheries [DMF], Coastal Zone Management [CZM], The Lobster Conservancy in Maine and recently with the Provincetown Center for Coastal Studies. We are active members of the Watershed Action Alliance of Southeastern Massachusetts, the Taunton River Campaign, and the Massachusetts Instream Flow Task Force. In 2006, we established a long term water quality monitoring station at Jones River Landing and work with DMF on the annual monitoring of Rainbow Smelt. Jones River is the largest river draining to Cape Cod Bay and provides important estuarine habitats and functions to support a diverse array of aquatic and avian life.

Concerns

JRWA is concerned that the NRC Staff has concluded that the continued operation of the cooling water system would have MODERATE impacts on the local winter flounder population, and the Jones River population of Rainbow smelt and would have small to moderate impacts on a considerable number of other aquatic species from impingement and entrainment at PNPS.

1. JRWA believes that there is sufficient evidence provided through the [2004-2006] DMF study on Rainbow Smelt to conclude that the population of smelt is **significantly** reduced and therefore continued impingement at equivalent rates under an extended license as evidenced over the past thirty years at the plant will have a SIGNIFICANT impact on this species.
2. In addition, JRWA is concerned that other species, especially the Jones River Alewife and Blueback Herring have not been fully evaluated, and are being **severely** impacted by plant operations. Annually hundreds, and at times tens of thousands of this fish are impinged, and have been found in the plant cooling system, including **in the spring prior to spawning.** In 1995 the Alewife was the dominant fish impinged, while the Rainbow smelt have been dominant at least two years.
3. Essential Fish Habitat was evaluated for many species. JRWA is concerned that the staff conclusion is not substantiated and should be reconsidered. The staff concludes [E-105] that "Continued operation of the PNPS cooling water system was determined to have a minimal adverse effect on EFH for 17 species, a less than substantial adverse effect on EFH for 8 species, **and a substantial adverse effect on EFH for 7 species"**.... (emphasis added) And goes on to conclude: "Within the overall Cape Cod Bay ecosystem, ...continued operation of the PNPS cooling water system would have a minimal adverse effect on EFH."

   We believe this is a wholly unsubstantiated conclusion because the staff has not evaluated the cumulative impact of fish loss to the general fishery. In our view, because Rainbow smelt, Alewife, Atlantic menhaden, Atlantic mackerel, Atlantic silverside, Blueback herring and winter flounder are important prey for Striped bass and Atlantic cod (as examples), the loss of sufficient populations of these smaller fish will ultimately impact on the population of the more valued Striped bass and cod—and therefore is a matter of great concern, that should not be dismissed. Many of the fish suffering large losses are now highlighted for dangerously low population levels (river herring, smelt, and menhaden) in the region although no NMFS management plan yet exists.

4. Given the staff conclusion that plant operations are likely to have Significant impacts on the EFH for American plaice, Atlantic cod, Atlantic mackerel, red hake, whiting, windowpane flounder, and winter flounder, and given the tenuous sustainability of many of these species, PNPS should not be re-licensed without significant upgrades to its cooling system **and** substantial mitigation efforts to help restore areas, such as salt marshes and spawning habitats in the Cape Cod Bay region that can help boost survivability of PNPS affected species.
5. In the same way that there is concern for the EFH for fisheries determined by NOAA to require Management Plans pursuits to the Magnuson-Stevens Act, so too should there be concern for the habitats essential to fish species that are experiencing precipitous population decline such as the Rainbow smelt, Alewife and Blueback herring, among others-- the **cumulative** impact resulting from the plant impingement and entrainment on population abundance on these fish, and thus on long term survivability, was not adequately examined.

Discussion

Rainbow Smelt
In 2004 the National Marine Fisheries Service (NOAA) listed *Osmerus mordax* as a Species of Concern Designation. The fishery is closed by regulation from March 15th to June 15th to protect spawning fish. The PNPS has consistently impinged adult fish and entrained eggs and larvae. Impinged fish have low survivability, and has occurred every year with some dominant years. NMFS apparently does not yet have an assessment of the impact of PNPS on the population of Rainbow smelt.

JRWA is very concerned about the decline in smelt population in the Jones River. Formerly the Jones sponsored the largest smelt run in Massachusetts, [DMF Report 1928], and now it is a mere shadow of that past. Significant impingement events have periodically occurred at PNPS and can be directly associated as a cause of the decline in the Jones. The essential habitat for this population of Rainbow smelt is very likely Cape Cod Bay, with PNPS as the largest negative influence. Smelt generally live less than 1 mile from shore and in water less than 19ft deep. Given that an estimated 76% of the species is preyed upon annually by other fish and birds (NOAA.gov information sheet), loss of this food source could have a significant impact on other species. While the SEIS and staff report a potential MODERATE cumulative impact on the smelt, there is no reasonable discussion that this impact would have on a broader range of species.

JRWA is of the opinion that the present low population numbers of Rainbow smelt, the designation of Special Concern by NMFS, and the ongoing impingement of adults as well as entrainment of eggs and larvae, including occasional dominant species impingement events at PNPS, is sufficient reason for NRC to determine that continued operation of the once through cooling as now configured will have a SIGNIFICANT and potentially catastrophic impact on the remaining population—and that this impact is NOT acceptable.

Alewife (*Alosa pseudoharengus*)
The alewife was once abundant in the Jones River. Because it is the largest river in Cape Cod Bay, at least potentially, the Jones is one of the largest spawning areas. The Jones River run sees migrating fish by April 1st with the run lasting into June. Now, monitoring for this and the related Blueback herring show dismal population counts. JRWA will perform its third annual herring count this spring. In 2006, during the April and May period, with daily counts totaling 6550 minutes of effort, a total of 278 fish were counted in the Jones River. This is only slightly more than the mean number of fish impinged by PNPS between 190 and 2001. In a single event in 1995, 13,100 Alewife were impinged, while the total for the year, according to Pilgrim[1], approaches 27,000. However, a DEP Memo of Gerald Szal of August 2005, puts the number closer to 40,000. (see box below) "Over the last 25 years they (alewife) have the third highest impingement rate at PNPS." [p2-34]. The report however fails to discuss biomass and population sustainability in light of this high impingement rate. JRWA is of the opinion that the impingement factor at PNPS may well be having an adverse impact on the species survivability in the Jones River and Cape Cod Bay region. Plant continuation must be conditioned on an upgraded and improved cooling water intake and discharge, or an alternative cooling system that eliminates the risk to the population of alewife (and other important species).

The following fish species were considered those suffering the greatest numerical losses due to impingement over the last 11 years of monitoring at Pilgrim (Environmental Protection Group 2005):

Table 1

Year	Atlantic silverside	Atlantic menhaden	blueback herring	grubby	rainbow smelt	alewife
1994	36,498	58	269	1,094	9,464	123
1995	13,085	1,560	1,244	648	2,191	39,884
1996	16,615	2,168	2,462	1,347	3,728	216
1997	6,303	1,329	424	405	1,978	317
1998	6,773	1,423	134	335	1,656	158
1999	8,577	42,686	550	628	875	610
2000	25,665	34,354	5,919	1,105	13	2,443
2001	4,987	3,599	229	517	879	1,618
2002	4,430	53,304	943	1,087	335	334
2003	23,149	119,041	1,968	237	532	438
2004	13,107	10,431	2,046	2,257	1,092	145

Of particular interest are the rainbow smelt. These fish are an anadromous species and smelt impinged at Pilgrim most probably come from the Jones River population. Although there are two other rainbow smelt runs (Town Brook and Eel River) in the Plymouth/Kinston/Duxbury Bay area they are apparently quite small in comparison to that from the Jones River (based on pers. comm., Brad Chase, MA Division of Marine Fisheries [DMF] to Gerald Szal, DEP). Rainbow smelt are not known to reproduce elsewhere in streams entering Cape Cod Bay or in streams elsewhere on Cape Cod.

[1] Marine Ecology Studies Related to the Operation of Pilgrim Station Annual Report #61:April 29,2003, p. 17

Blueback Herring (*Alosa aestivalis*)
Blueback herring spawn in the Jones River during the same general period as the alewife. The spawning migration begins in April for river herring and extends into June. The run seems to include fish of all age classes so it is difficult to determine without additional study at what the age the fish are spawning. Blueback herring have different habitat requirements, at least in the river, yet they were not discussed in the SEIS. However, *Marine Ecology Studies Related to the Operation of Pilgrim Station; Annual Report #61* for the year 2002, show that Blueback Herring were the dominate species impinged in November that year and fifth in rank for the year. (Table 5) Yet this species is not evaluated in the SEIS.

Sand Tiger Shark (*Odontaspis Taurus*)
This animal is not mentioned in the SEIS, which we bring attention to here, as it is designated by NMFS as a Species of Concern Designation, and it has been caught and tagged over the past two years in the Jones River estuary. From evidence of the fish caught, we know that the sand tiger feeds on striped bass, and we know that Striped bass feed on smelt, herring and menhaden, etc.

We are concerned as we have stated above, that the SEIS has so segmented its analysis of the impact on fisheries as to lose sight on the general and cumulative impact upon the web of fish in the food chain. Ecosystem analysis requires that the operation is evaluated against broad impacts to Cape Cod Bay populations and habitats as well as upon the 66 or species of fish inpinged and entrained by plant operations. We do not know enough about Cape Cod Bay and its dependent species to be confident in the assessment that MODERATE impacts on smelt and winter flounder are only that, and can be ignored.

Mitigation
Mitigating aquatic population loss is different from requiring mitigation of water quality impacts, which the NRC staff state is beyond its jurisdiction to regulate. However, direct kill rate of species is distinct from water quality degradation that impairs habitat and as a result, affects fish. Here we must address the systematic damage to species that, over time, results in a loss in the environment that could significantly impair the ability of other species to survive—and thus NRC should require mitigation. At this time we know that Rainbow smelt, river herring, Atlantic mackerel, winter flounder, Atlantic cod and other fish impacted by the plant are troubled by declining numbers, while some, like the cod, have FMP, others are listed as Special Concern. Impacts of the Pilgrim plant upon these species should be avoided, and if they are not, those impacts must be mitigated so as to not lose important fish populations. Retrofits to the intake and discharge structure should be required to avoid fish kills.

That PNPS is supporting hatchery release of winter flounder, is not itself sufficient to address all the impacts to fish and aquatic organisms. In fact, hatchery fish may not even be good mitigation for winter flounder, as over time the genetic pool of the species may become so narrow as to threaten the ability of the Cape Cod Bay flounder to adapt, or overcome adversity. A hatchery mitigation and release plan cannot become a license to kill

flounder, nor can a program for growing winter flounder for release into the wild address the impacts to the other species of fish, such as Rainbow smelt, Alewife, Blueback herring and Atlantic mackerel or menhaden. It should be required that PNPS assist these populations of concern by correcting its flawed intake structure and assist in habitat restoration activities in the region.

NON-fish related comments on SEIS

Availability of Materials

Raw data and original reports are needed to provide independent evaluation of the conclusions reached by the staff. JRWA was not provided with monitoring data and reports, and found it was dissatisfied with the synopsis of data provided in the SEIS. When multiple reports were available, general data reporting did not seem to agree (i.e. Szal and Pilgrim Report #61). We request that raw data and the monitoring reports required by the NPDES permit be made available. We request that these documents be on deposit at local libraries, and/or that they be made available on-line.

JRWA does not present itself as an expert on any of these matters. However, we were limited in our ability to get assistance for review and investigation given that we only had the conclusions of others to evaluate. Although the SEIS is instructive, conclusions made are impossible to evaluate without the benefit of the original material. As studies and reports are produced, we request a public repository contain information, monitoring data and environmental impact assessments of whatever nature, relative to PNPS .

Other environmental impacts

Water Supply: Silver Lake

JRWA briefly reviewed other aspects of the report, including 2.2.8.2 Public Services. The "Selected Plymouth County Public Water Supply Systems and Capacities in 2003" ignores the largest water supply in the county, the surface water reservoir at Silver Lake. Silver Lake is 640 acres, and is just beyond the 10 mile EPZ in the towns of Kingston, Pembroke, Plympton and Halifax. It is the primary water supply for nearly 100,000 users in Brockton and Whitman. At this time an average of about 10 million gallons a day are piped to those communities. Brockton qualifies as a social justice community. Silver Lake should be regularly monitored for radiological pollution.

Strontium in Groundwater: Municipal wells

USGS performed water quality analysis of regional drinking water wells in 2005 in response to an EPA general program. The presence of Strontium was included in the analysis, and results were provided by weight—without discussion of radioactivity. The highest levels of Strontium in the region were found in the Kingston Millgate well. Discussion with USGS confirmed that the level was high, and that no lab notes provided a further description regarding any analysis for radioactive Strontium-90.
JRWA believes that off –site sampling of groundwater should be included to assess impacts from past and present radioactive venting of gases at Pilgrim. Radiological

monitoring does not include this human and environmental exposure pathway. Ingestion of Strontium-90 is tolerated at MUCH lower doses than airborne exposure.

JRWA believes that off–site sampling of regional groundwater should be included to assess impacts from past and present radioactive venting of gases at Pilgrim. Radiological monitoring does not include this type of sampling and the exposure pathway to residents of the area is direct. Dangerous levels of dosing are entirely possible, and have the potential to be long lasting. In the USGS testing, only a few representative wells were sampled and analyzed.

The Millgate well is supplied by groundwater which, if not used in drinking water distribution, will ultimately flow to the Jones River. Groundwater in areas of Plymouth flows to Cape Cod Bay. JRWA requests that PILGRIM and NRC test for the presence of Strontium-90 in regional groundwater.

The Evacuation Plans have been removed from Kingston Public Library—the only documents relative to nuclear power are the NRC newsletters. This is not acceptable.

Terminology needs be explained. Such key language as "significant", "moderate", "less than substantial", "minimal adverse" need qualifying definitions in order to understand the implications of the SEIS.

Conclusion

JRWA is concerned that the adverse environmental impact from impingement and entrainment at PNPS of fish and aquatic organisms that depend on Cape Cod Bay and the Jones River estuary is so severe as to require a change to the once-through cooling system, or a halt to plant operations. No re-licensing should occur without change to a closed-loop cooling system or better available technology. Further, the evidence suggests that impacts to fisheries over the past thirty years have been instrumental in causing declines in fish species populations—especially Rainbow smelt, Alewife, Blueback Herring, as well as winter flounder and others—and therefore, substantial increase in mitigation strategies must be required.

Respectfully submitted,

Pine duBois
Executive Director

PNPS-D-00

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
1 CONGRESS STREET, SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

February 28, 2007

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

Re: Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 29 Regarding the Pilgrim Nuclear Power Station, Draft Report for Comment (CEQ #20060510)

Dear Sir/Madam:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act we have reviewed the Nuclear Regulatory Commission's (NRC's) Draft Supplemental Environmental Impact Statement (DSEIS) for License Renewal of the Pilgrim Nuclear Power Station (Pilgrim Station) in Plymouth, Massachusetts.

According to the DSEIS, Entergy Nuclear Operations, Inc. (Entergy or the applicant) has requested a 20-year renewal of the facility operating license (extending the license to 2032) for Pilgrim Station. Pilgrim Station is a 715 megawatt electric generating station adjacent to Cape Cod Bay. Commercial operation of the station began in December 1972. Pilgrim Station's cooling water system provides once-through cooling water to the condenser and uses up to 510 million gallons per day of water from Cape Cod Bay. Cooling water passing through the condensers undergoes a temperature rise of about 32°F above ambient temperature before it is discharged back into the bay.

The DSEIS was prepared to provide site specific information to supplement NRC's 1996 Generic EIS for License Renewal of Nuclear Plants. The DSEIS contains the NRC staff's preliminary recommendation that adverse environmental effects of license renewal at Pilgrim Station "are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable." (DSEIS, page xxi).

Operation of Pilgrim Station has resulted in a range of impacts to the ecosystem of Cape Cod Bay. EPA offered scoping comments to the NRC in June, 2006, that recommended that the EIS pay particular attention to impacts associated with the entrainment of fish eggs and larvae and the impingement of juvenile and adult fish as a result of plant operations, especially with respect to winter flounder, Atlantic cod, and rainbow smelt. EPA's comments also noted that winter flounder is a species of particular interest due to

its commercial, recreational and ecological importance and that estimates of winter flounder Age-3 adult equivalent losses due to entrainment and impingement as reported by Pilgrim Station in annual monitoring reports have ranged from <1 % of the Cape Cod Bay population to almost 30% of the population annually. EPA's comments noted that the NRC should use documented impacts to the marine environment from the thirty-four years that Pilgrim Station has been in operation to evaluate the direct, indirect, and cumulative impacts associated with a twenty year license extension. In addition, EPA recommended that the EIS explore alternative modes of operation that would avoid and minimize environmental impacts (such as changes to water quality and biological effects from the facility's discharges and biological effects from the entrainment and impingement of marine organisms by the facilities cooling water intake structure (CWIS)) associated with the current mode of operation.

EPA's comments on the DSEIS, which are contained in the attachment to this letter, highlight areas where additional information is needed to more fully describe the impacts of the Pilgrim Station facility. Specifically, these comments address the evaluation of alternative modes of facility operation, alternative technologies and mitigation measures and the assessment of the environmental impacts of these alternatives, including the alternative of continuing current operations. Environmental impacts discussed in our comments include entrainment and impingement impacts on marine organisms; the impacts of cooling water discharges and thermal backwash operations; and the fish return system. In particular, we recommend that the Final Supplemental Environmental Impact Statement (FSEIS) evaluate measures such as retrofitting the once-through cooling system with closed-cycle cooling to mitigate adverse impacts identified in the DSEIS such as entrainment and impingement. We encourage the NRC to address these issues prior to the close of the NEPA process.

The intake and discharge of water at Pilgrim Station is regulated under EPA's Clean Water Act's National Pollutant Discharge Elimination System (NPDES) permit. As discussed in the DSEIS, Entergy has submitted an application to EPA for renewal of the Pilgrim Station NPDES permit. The comments in this letter are based solely on our review of the information in the DSEIS from the standpoint of our NEPA and CAA Section 309 responsibilities and are not intended to address the requirements of the Clean Water Act NPDES permit. We again note that while we encourage the NRC to fully analyze the issues described in this letter, we do not expect the FSEIS to draw conclusions as to whether changes to plant operations and existing permit conditions governing discharges and cooling water intake are necessary to meet the requirements of the Clean Water Act, as this responsibility rests with the EPA.

For the reasons discussed above (and in the attachment which follows), EPA has rated this DSEIS "EC-2 Environmental Concerns-Insufficient Information" in accordance with EPA's national rating system, a description of which is attached to this letter. We look

forward to reviewing responses to the issues highlighted in this letter and technical attachment in the FSEIS. My staff is available to provide additional input, as necessary, to help the NRC respond to the issues discussed in this letter. Please feel free to contact Timothy Timmermann of the Office of Environmental Review at 617/918-1025 if you wish to discuss these comments further.

Sincerely,

Robert W. Varney
Regional Administrator

Attachment

3

Summary of Rating Definitions and Follow-up Action

Environmental Impact of the Action

LO--Lack of Objections
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC--Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO--Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

4

Detailed Comments
Generic Environmental Impact Statement for License Renewal of Nuclear Plants
Supplement 29 Regarding the Pilgrim Nuclear Power Station
Draft Report for Comment

Comments related to the assessment of environmental impact from the entrainment of fish and other aquatic organisms

1. Larval transport studies were conducted in 2000, 2002, and 2004 for the purpose of comparing the percentage of winter flounder moving by Pilgrim Station to that which is entrained through Pilgrim Station's cooling system. Page 4-12 of the DSEIS presents 2004 data that indicates a 20 percent entrainment rate of stage 4 winter flounder for one survey and less than 1 percent in another survey. The DSEIS indicates that the authors of the studies "emphasized that the higher rate may have been a result of some methodological difficulties such as lost sampling gear, resulting in no sample collection from several survey locations." We note that the DSEIS does not appear to include data to support these conclusions and we recommend that an expanded explanation of the higher entrainment rate be provided in the FSEIS.

2. The DSEIS (DSEIS page 4-13) discusses the 2000 and 2002 larval transport data and adds that these "reports state that the periodic high entrainment rates observed for stages 3 and 4 larvae were likely due to difficulties in collecting the stages 3 and 4 larvae, as these larval stages generally are associated with the bottom sediments." It is our understanding that stage 3 winter flounder are found in the water column. In addition, one of the two surveys in 2004 shows a stage 4 larval entrainment rate of 20 percent. We recommend that the discussion in the FSEIS reflect the entire data set.

3. Section 4.1.1.4 of the DSEIS "concludes that the impact of entrainment on marine aquatic species other than the winter flounder population would be minor." However, it does not appear that this conclusion is fully supported in the DSEIS and EPA encourages a closer evaluation of measures to mitigate the adverse impacts of the once-through cooling system. Without effective mitigation measures to reduce entrainment, several fish species will be adversely affected. The DSEIS (DSEIS page E-105) acknowledges this impact by indicating that the continued operation of the Pilgrim Station cooling water system would have a "substantial adverse effect on EFH for 7 species" in the vicinity of Pilgrim Station.

4. Based on the information presented, and given the three tiered NRC classification system (i.e., Small, Moderate, Large), we agree with NRC's conclusion in Section 4.1.1.4 of the DSEIS, Summary of Entrainment Impacts, that the "continued operation of the PNPS would have a MODERATE impact on the local winter flounder population due to entrainment over the course of the license renewal term" and "a SMALL to MODERATE impact on the overall Gulf of Maine winter flounder stock as well as on all other marine aquatic resources due to entrainment." These conclusions about the level of impact appear justified by the entrainment data collected to date. We recommend that the FSEIS include a more comprehensive evaluation of the effectiveness and engineering

feasibility of measures to mitigate this entrainment impact, including retrofitting the once-through cooling water system with closed-cycle cooling technology.

Comments related to the assessment of environmental impact from the impingement of fish and other aquatic organisms

1. Section 4.1.2.1 of the DSEIS explains that 97% of the over 300,000 fish impinged during 2005 were Atlantic menhaden and that their survival was low (18 and 27%). In addition, there were 19 impingement events (>20 fish/hr) in 2005 which consisted primarily of Atlantic menhaden and Atlantic silversides. Even though the DSEIS acknowledges that "menhaden is one of the most commercially important fish species along the Atlantic Coast" (DSEIS page 2-37), there is little discussion regarding the impact of the impingement losses in Section 4.1.2.2 other than relying on ENSR reports and general statements such as "[t]he Atlantic menhaden stock is considered to be healthy with stable stock size and high biomass." Furthermore, although the DSEIS recognizes that "due to the lack of recent information describing the status of several local populations, it is difficult to quantify impingement impacts," it concludes that "impacts on marine aquatic species other than the Jones River population of rainbow smelt would be minor." EPA recommends that the FSEIS expand on this discussion of impingement impacts and more fully explain the basis for the conclusion that the impacts would be minor.

EPA agrees with the final conclusion in Section 4.1.2.3 of the DSEIS that the "continued operation of PNPS would have a MODERATE impact on the Jones River population of rainbow smelt due to impingement over the course of the license renewal term" and "SMALL to MODERATE impacts on other marine aquatic resources due to impingement." EPA recommends that the FSEIS evaluate further mitigation options for these impingement impacts.

2. EPA's scoping comments noted that the majority of rainbow smelt impinged at Pilgrim Station are believed to have originated from the nearby Jones River population and that without quantification of the size of that population it is not possible to fully assess the relative impact of Pilgrim Station's operations on rainbow smelt. The DSEIS (DSEIS page 4-27) indicates that "considerable uncertainty exists regarding potential impacts to rainbow smelt populations." The DSEIS discusses mitigation measures that could be implemented to reduce impingement event impacts at Pilgrim Station (DSEIS page 4-36) with what appears to be limited analysis of whether they would be effective and to what degree they could be expected to reduce impacts. EPA recommends that the FSEIS expand on that analysis.

3. We also note the discussion in the DSEIS at page 4-27 which states, "Although the loss of winter flounder juveniles and adults through impingement may be contributing to population declines, the level of impact is considered to be minimal when compared to the potential entrainment impacts." We suggest that this comparison is inappropriate and that instead of comparing the two types of impact (entrainment and impingement) that

may contribute to population declines, they both be considered together in the cumulative impact discussion.

Mitigation Measures

Automated Chlorine Monitoring System

The DSEIS (DSEIS page 4-35) lists an automated chlorine monitoring and warning system for the service water and/or condenser cooling water systems as a means to possibly mitigate for a portion of the potential impacts of the continued operation of Pilgrim Station. EPA recommends that improvements to the screenwash system be included in this discussion because chlorine exceedences occurred when there were problems with the screenwash dechlorination system. EPA also recommends that the FSEIS include an evaluation of the potential for reduced impacts associated with the installation of an automated chlorine monitoring system that includes a malfunction notification component.

Light

On page 4-35, the DSEIS indicates that "ENSR (2000) determined that, of the behavioral barriers evaluated, light barriers would be the most effective as several studies have shown that some fish species are attracted to light." This statement should be clarified since an effective barrier would typically repel, not attract, fish.

Cooling Water Bypass Flow

EPA does not believe that the cooling water bypass flow mitigation measure discussed in the DSEIS (DSEIS page 4-37) should be presented as a measure to mitigate for impingement and entrainment impacts since the intake flow at the CWIS remains unchanged.

Winter Flounder Stocking Program

The DSEIS at page 4-38 indicates that NRC staff have not found that the pilot flounder stocking "has substantially offset impacts from continued operation of PNPS to the local winter flounder population." The DSEIS also does not provide any new information or evidence to suggest that hatchery fish can persist in the environment and recruit to the adult population. Thus, the DSEIS appears to lack support for the assertion that if the current winter flounder stocking program is expanded, that it "may have a beneficial impact" on the local population (DSEIS page 4-38). If the continuance or expansion of the stocking program remains a reasonably foreseeable option for Pilgrim Station, we recommend that the FSEIS more fully explore whether stocked fish survive to reproduce and the potential impacts of hatchery-reared fish on the native population.

Fish Return System

The DSEIS (DSEIS page 4-25) indicates that a reimpingement study during the 80's was never completed. Also, the DSEIS (DSEIS page 4-37) lists moving the fish return sluiceway discharge point as a mitigation measure to avoid reimpingement. We recommend that this section of the FSEIS be expanded to include a discussion of the effectiveness of physical and operational modifications to the fish return system including more frequent or continual screen rotation.

Alternate Cooling Water Intake Technology

The evaluation of alternative mitigation measures and cooling water intake structure technologies in the DSEIS (DSEIS pages 4-34 through 4-38) is limited to a listing of various measures. We recommend that this analysis evaluate the benefits of such systems as well as their engineering feasibility and associated adverse impacts, if any.

The DSEIS analysis of closed-cycle cooling in Chapter 8.0 (the environmental impacts of alternatives to license renewal) considers the impacts of closed-cycle cooling associated with the construction of a new nuclear generating station at a greenfield site. In addition to considerations of closed-cycle cooling at a greenfield site, EPA recommends that the analysis of alternatives be expanded to include an evaluation of a retrofit of the existing Pilgrim Station facility to closed-cycle cooling.

Thermal Plume from operation

EPA's scoping comments requested an update of the analyses of thermal plume impacts in light of current information and it appears that the DSEIS only provides a summary of existing data from 1995 and 2000 reports. EPA recommends that the FSEIS provide more recent data if they are available.

Also, EPA's scoping comments suggested that the DSEIS should include the consideration of a biological surveillance program to address impacts to fish. This measure does not appear to be analyzed in the DSEIS and EPA continues to recommend that this impact minimization option be more fully explored in the FSEIS.

Dredging

EPA's scoping comments asked that the DSEIS contain a discussion of future dredging needs for the facility. The DSEIS at page 4-69 explains that the applicant doesn't plan to dredge. However, the DSEIS at page E-63 explains that dredging occurred in 1982 and 1990. While the applicant may have no plans to dredge at this point in time, EPA recommends that the FSEIS reflect that dredging of portions of the facility over the relicensing term may be likely given the past dredging history of the facility.

8

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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2-27-07

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

RE: NUREG-1437 Supplement 29 draft
PILGRIM NUCLEAR POWER FACILITY

Dear Chief,

Please be advised that I support and concur with the comments submitted by PILGRIM WATCH dated February 5, 2007, regarding the above captioned matter on the re-licensing of the Pilgrim Nuclear Power Facility. I have the following additional concerns & comments along with some documentation as attachments hereto:

1- You have no safe or secure area to store the radioactive wastes generated by your nuclear power plants. As my AMISH neighbors have repeatedly stated at the local meetings near Three Mile Island for 28 years, "You built a house without an outhouse!" I do not need to elabrate on all the ways TERRORISTS can do harm - but it is easier than you'll ever admit & your test drills are phony & unrealistic.

2- Embrittlement concerns of your aging reactor vessels. It is only a matter of time!

3- With the June 1982 blow out of filters & subsequent radiation releases as an excellent example of "accidental radiation releases" at alarming levels & with horrific varieties of radionuclides - human health effects are inevitable & I would expect to find visible effects of

By: Mary Osborn (Occasional)

2-27-07, page 2:
Chief, Rules Review & Directives Branch
NUREG-1437, Supplement 29, draft. Pilgrim Nuclear.

radiation damage to the flora & fauna of the surrounding areas of Pilgrim facility - such as that occurring for the past 28 years around Three Mile Island; see attachments 2 thru 7. Not only concern for flora & fauna - but for all edibles! Thus increasing the risks for cancers.

4- Deliberate mis-statements/mis-representations by the NRC and other industry affiliations: The NRC has not learned the lessons of Three Mile Island accident - where NRC staff knew of leak rate problems for weeks prior to the accident - yet failed to shut down the reactor for repairs. The NRC continues with its obfuscations all over the country with similar, serious reactor plant problems (Davis-Besse, etc). At Three Mile Island we are still waiting for former President Jimmy Carter to reveal what he has covered-up: The President's Report, a/k/a the Kemeny Commission Report..."suppressed the most alarming aspects of that report." "... the report, if published in its entirety, would have destroyed the civilian nuclear power industry...." see attachments 1 & 8. Based on this statement alone - you, the NRC, should not relicense Pilgrim. We, the people, do not trust the NRC to protect us. You lie & believe your own lies. You are destroying the industry because of profits before people. At Three Mile Island country we have the highest thyroid cancer rate in the country and the only cause is the Three Mile Island fallout of 1979. We received BOMB TEST FALLOUT EQUIVALENT doses at TMI and the U.S. Government - IVORY PURPOSE knows it!

Submitted by: Mary Osborn (ovassiai) 4951 Highland St., Hbg PA 17111
(717) 939-2890

Toronto, Canada
July 18, 1986

In May, 1983, my father-in-law, Admiral Hyman G. Rickover, told me that at the time of the Three Mile Island nuclear reactor accident, a full report was commissioned by President Jimmy Carter. He (my father-in-law) said that the report, if published in its entirety, would have destroyed the civilian nuclear power industry, because the accident at Three Mile Island was infinitely more dangerous than was ever made public. He told me that he had used his enormous personal influence with President Carter to persuade him to publish the report only in a highly "diluted" form. The President himself had originally wished the full report to be made public.

In November, 1985, my father-in-law told me that he had come to deeply regret his action in persuading President Carter to suppress the most alarming aspects of that report.

Jane Rickover
Jane Rickover

JANE RICKOVER appeared before me and swore as to the truth of the above statement.

Dated at Toronto this 18th day of July A.D. 1986

William F. Lamson Q.C.
Notary Public for the
Province of Ontario

ATTACHMENT 1.

The Lupine told me, "Three Mile Island did it!"
Mutation: Lupine = stem fasciation - double flower tip - distorted, Ahmed.
ATTACHMENT

Could you farm through fallout?

By ALEXANDRA KNOX

Suppose the Hanford Nuclear Reactor in Washington State suffers a meltdown, spewing 7% of its radioactive core into the atmosphere. Winds headed east across the U.S. would bury some of this country's prime farmland in fallout—the kind that sticks around for decades.

Not likely, you say? Maybe not. But the "Bulletin of the Atomic Scientists" at one time considered it possible enough to come up with this scenario:

"Truck farmers in central Idaho are told to plow under leafy vegetable crops such as spinach and lettuce [because radiation sticks to vegetation]; Minnesota dairy farmers are told to keep all their livestock in barns [to limit exposure and prevent grazing on contaminated forage]; in Madison, Wis., dairy sales fall 90% in response to rumors of radioactive iodine in milk . . ."

Depending on the time of year, precipitation patterns and soil types involved, South Dakota's sheep could turn up radioactive years later, having grazed on forage that has confused cesium-137 and strontium-90 with potassium and calcium. Wyoming's beef cattle, having accumulated cesium over hundreds of acres, could measure "well-done" on a Geiger counter. And in the Northeast, with its nutrient-poor, rock-bottomed lakes, certain fish might become the hottest food around.

Over the long-run, crops like corn and wheat would be in relatively good shape because their leaves—not the grain itself—would hold most of the radioactive particles.

Scientists picked the Hanford plant for good reason. It is the U.S.'s version of the Chernobyl Atomic Energy plant that melted down in Russia two years ago this month. The Hanford plant had been leaking for years. Last year, in light of safety problems spotlighted by the Chernobyl accident, the Hanford plant was shut down.

But nuclear plants around the world are aging, a fact that's not lost on people who deal in food—whether they raise it or trade it.

In mid-February, rumors of another nuclear accident in Russia sent domestic markets into a fury. Although the "nuclear" accident actually turned out to be a chemical spill, it's an example of how nuclear problems have become an everyday concern.

Throughout Europe, farmers are right now living—and farming—with a situation exactly like the one outlined above.

Although the Chernobyl reactor itself has since been incarcerated in concrete, the damage from it persists. Some of the fallout's effects in agricultural areas are just beginning to surface:

- Cesium-saturated grazing areas in Lapland continue to contaminate thousands of reindeer, at an estimated cost of $182 million.
- In Sweden, radioactive milk, fish and wild mushrooms are still a problem.
- Northern England, Wales and Ireland report radioactive sheep. Radioactive meat from Denmark has appeared in Venezuelan ports. Turkey has "hot" hazelnuts, and West German deer have set off Geiger counters.

The Chernobyl experience provides a better understanding of how farmland interacts with fallout. The accident has, in effect, offered scientists a real-world laboratory for combating radioactivity in our soils.

In late-April 1986, winds carried radioactive particles and gases thousands of miles from the Chernobyl Atomic Energy Plant. Rain and snow cleared the air but loaded vegetation and soils with iodine-131, cesium-134, cesium-137 and, to a lesser degree, strontium-90. The fallout forced the Soviets to remove and bury 650,000 cubic yards of contaminated soil—about 400 acres scraped one 1' deep.

Tuday, the 18-mile zone surrounding the plant in the agriculturally important Ukraine remains highly contaminated in parts, say the Soviets, although safe enough to allow the return of some of the 115,000 evacuees. Farming there is impossible.

But that's just a small part of the Chernobyl problem. Damage to crops, livestock and farmland ranges far from the site. Radioactivity from the accident is still playing havoc with farmers' livelihoods.

Take Lapland, for instance. A forested wilderness extending across northern Norway, Finland, Sweden, Lapland lies about 1,100 miles from Chernobyl. The lichen that carpet its forest floors are saturated with cesium-137, a radioisotope with a half-life of over 30 years

ATTACHMENT 3

(that is, its radioactivity will be half as active in 30 years as today).

Reindeer herded and eaten by the Lapps graze on the lichen. Swedish authorities have detected up to 100 times more radioactive cesium in those reindeer than permissible. Tens of thousands of reindeer have had to be fed to mink instead of sold for human consumption. To lessen the economic blow, the Swedish government buys the contaminated meat at an estimated $182 million.

The contamination elsewhere in Sweden is abating. Yet some farms are today producing radioactive milk; fish in Sweden's nutrient-poor, granite-bottomed lakes are showing higher and higher concentrations of radioactive cesium; and wild mushrooms—very popular in Sweden—remain off limits, says Ake Bruce, nutrition expert at Sweden's National Food Administration.

It takes several years for cesium to migrate from the environment to food and then to humans. In most cases, concentrations diminish. In others, radioactivity can increase. How long before it goes away? Sometimes very long.

In northern England, sheep from 635 farms suffer from radiation levels exceeding government safety limits, according to the Country Landowner's Association.

The problem is that the soil where these sheep graze has failed to trap the cesium. Two years ago, says Frances Livens, radiochemist at the Institute of Terrestial Ecology in Britain, "We thought the cesium would lock up in the soil in three months. We're finding that the relatively acidic soils high in organic matter can't do that."

Livens speculates that it may take years before the cesium locks up in "peats and thin, nasty soils." Meanwhile, hundreds of thousands of sheep are banned from public sale. The affected farmers may have to wait *three decades* before they can sell their animals on the open market.

Scientists have discovered that, generally speaking, the stingiest soils under the nuclear cloud's path are those most likely to offer long-term harvests of cesium-137. That's because crops grown on poor soils will take whatever nutrients they can get. Plants on richer soils will usually choose standard elements before chemically similar radioactive ones.

Carl Rosen, soil scientist at the University of Minnesota, explains that cesium behaves like potassium in soil. In basic soils, cesium is trapped by clay particles. Likewise, say Swedish scientists, cultivated, fertilized soils rich in minerals bind cesium ions. But in poor soils with little clay and minerals (tundra, sandy soils) or mostly organic matter (such as peats and tropical soils), cesium remains available to plants.

To limit the migration of cesium into the food supply, the USSR has had to deep plow, irrigate and lime hundreds of thousands of acres. Additional measures, says Harold Denton, a Nuclear Regulatory Commission (NRC) director, include treating highly contaminated areas with calcium to fix radionuclides in the soil. "Then the areas might be sown with crops such as lupines that absorb radionuclides. These crops would then be harvested and buried."

Generally, cesium-137 will reside near the soils' surface unless plowed under. Thus, shallow-rooted crops like potatoes or sugar beets are more likely to be long-term problems than deep-rooted ones like grains, says Gary Paulsen, Kansas State agronomist. He says contamination depends on the stage of growth and even variety; however, soybeans, requiring more potassium than grasses like rye, are likely to take more cesium up through their roots.

In the short-run, according to George Ham, Kansas State agronomist, rice would best resist the tissue-damaging beta particles emitted by radionuclides. Corn, sorghum, potatoes and sugar beets are moderately resistant. Wheat, oats and barley are very sensitive.

Processing removes much of the contamination. Potatoes lose radionuclides when made into starch; in milk they are filtered out during cheese-making. Other good crops are flax or cotton, because they aren't edible. "As it happens, rye, potatoes and flax are customary crops in the soils of the Chernobyl area," says Denton.

Fighting fallout has proved disruptive, costly, rarely practical and full of unknowns, say experts. Our best lab is Russia, but its experience, like its fallout, make take years to surface. ◄

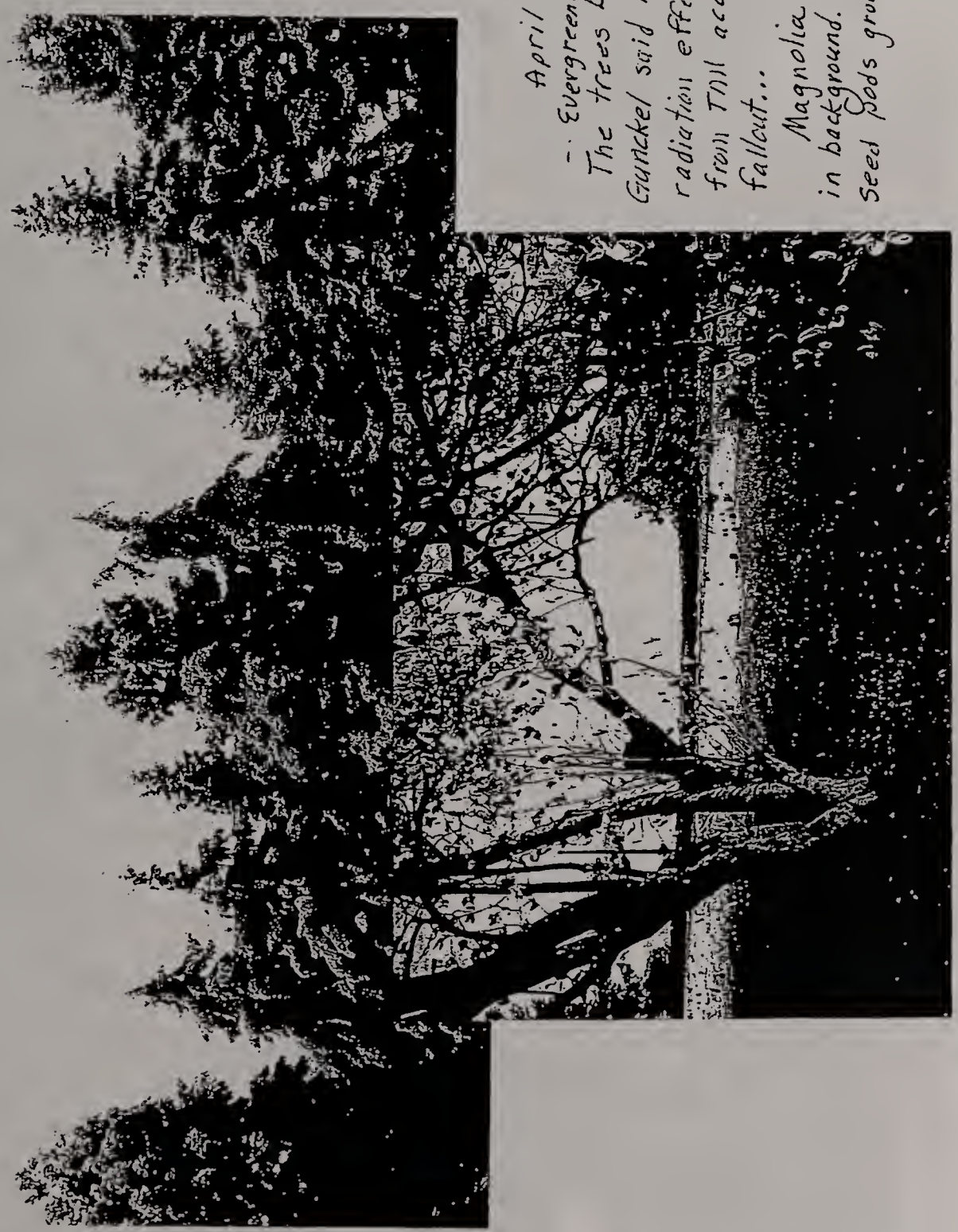
Europe in Chernobyl's after glow

SOURCE NUCLEAR ENERGY AGENCY/OECD

THIS MAP SHOWS THE AVERAGE amount of cesium-137 and -134 in 1,000 becquerels per squara meter, as measured on European soils from May 1986 to April 1987. Cesium concentrations are highlighted. Since the data were gathered, some of the cesium will have washed away or have been trapped in the soil. But plants and animals are still picking up the long-lived radioactive particles, even in some low fallout areas.

ATTACHMENT 4. (6 pages)

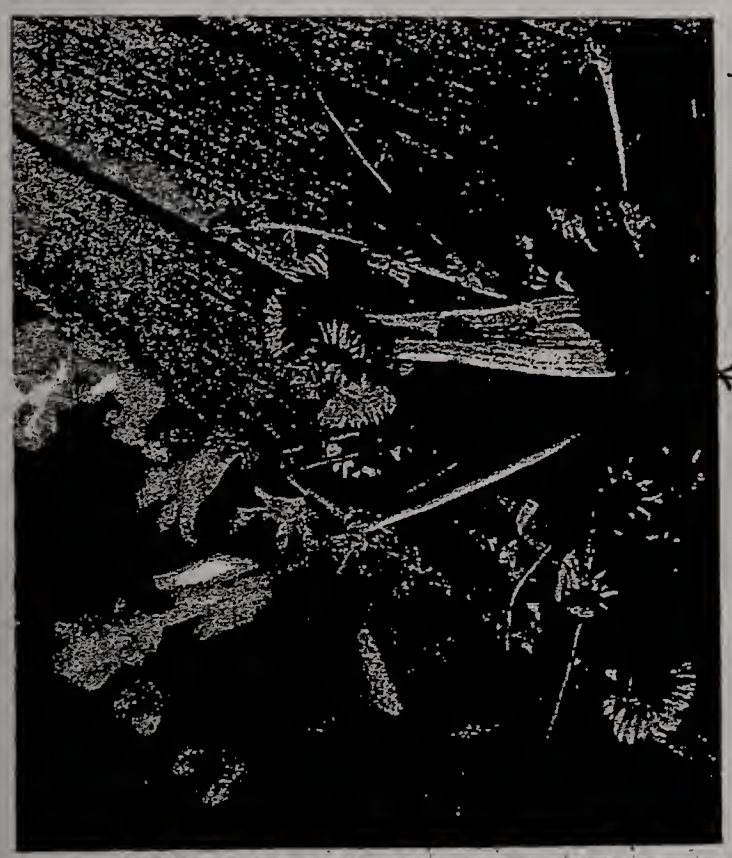
Trees dying -
all over central PA. ! to this day.!!



April 2006
-- Evergreens --
The trees DR. Jaime
Gunckel said had
radiation effects
from TMI accident-
fallout...
Magnolia w/ TMI
in background. The
Seed pods grow mutated.

ROSE ↑ 1987. NO REPRODUCTIVE PARTS

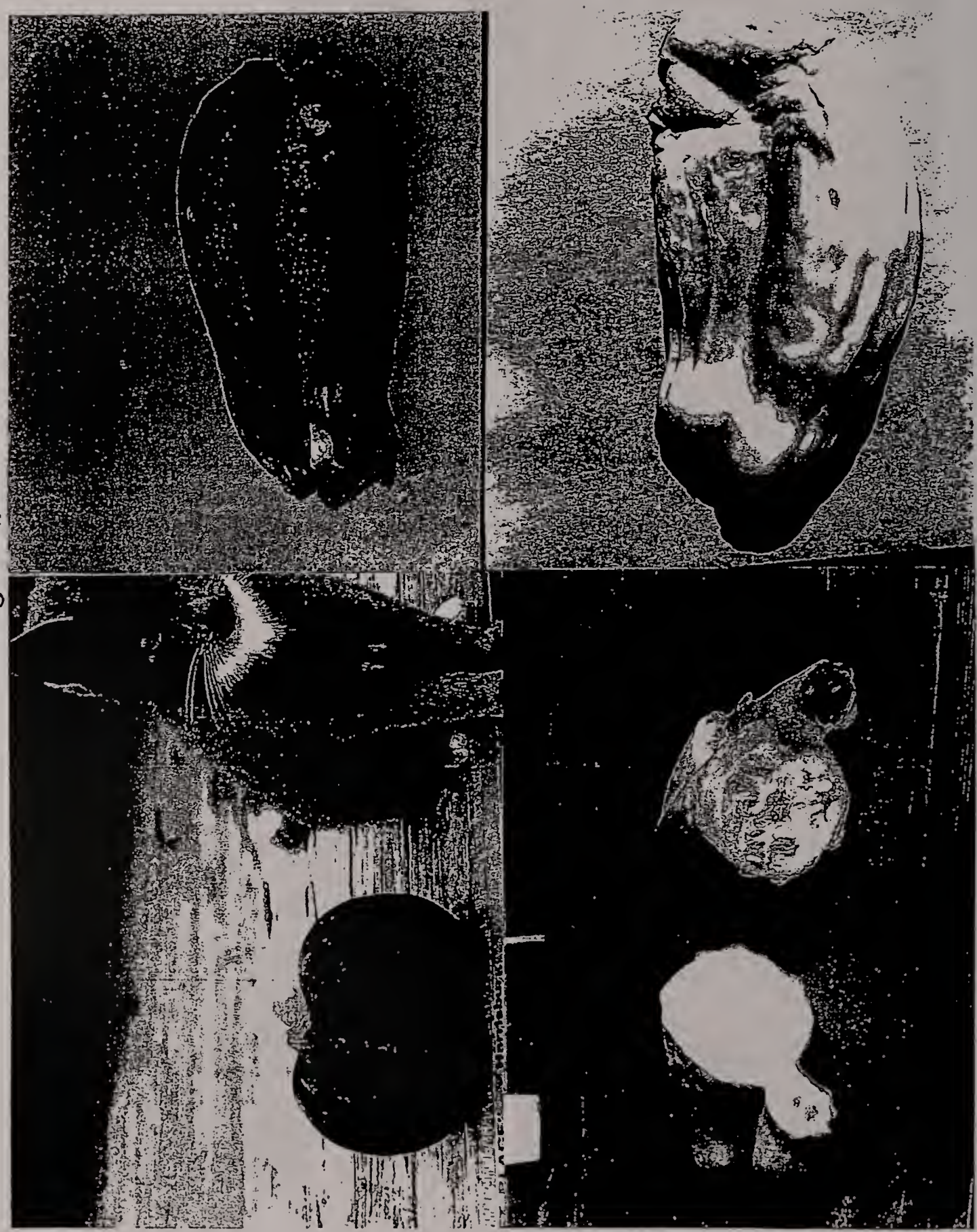
ROSE 1987. DOUBLE ↑ QUEEN ANNES LACE 1986 ↓



DANDELION 2002

1987

GLORIOSA DAISY 1989


DOUBLE SQUASH

ORK DISPATCH, MONDAY, NOVEMBER 28, 1983.

Irradiated pine forest a surprise

KNOXVILLE, Tenn. (AP) — Researchers who exposed a pine forest to gamma rays 20 years ago in an experiment on the long-term effects of a nuclear explosion now are trying to find out why it took so long for the trees to grow again.

So far, only a few seedlings have sprung up in the South Carolina forest, Dr. Frank McCormick, a University of Tennessee ecology professor, said.

When researchers returned to the forest last spring for the first time in 15 years, they were "shocked because revegetation seems to have stopped after five years," he said.

McCormick headed the research team that exposed the forest and others to radiation in an attempt to discover one of the environmental effects of a nuclear blast.

The researchers designed a radiation machine and used it in 1964 to expose 40 acres on the grounds of Savannah River Plant, McCormick said.

Researchers monitored the forest for the first five years after it was exposed, and recovery seemed to be progressing normally, McCormick said.

The Hope Diamond, the largest of all blue diamonds, 44½ carats, is slightly lopsided. It is probably due to the bottom part of the teardrop shape being cut away so the original stolen jewel could not be identified. The setting is a circlet of smaller white diamonds on a chain of diamonds.

10-I Sunday, Dec. 11, 1983 Philadelphia Inquirer

A forest in S.C. fails to recover

Pine trees exposed to radiation 20 years ago

By Patricia A. Paquette
Associated Press

KNOXVILLE, Tenn. — A South Carolina forest exposed to radiation in an experiment 20 years ago has failed to replenish itself, and some surviving trees are not growing normally, according to a University of Tennessee ecolngist.

Only a few seedlings have sprung up in the affected 40 acres on the grounds of the Savannah River Plant, said Frank McCormick, who headed the research team that irradiated the forest with gamma rays in 1964. He now teaches ecology at the University of Tennessee-Knoxville.

The few seedlings were not more than four years nld, and researchers are not sure why the recovery was delayed, McCormick said.

When researchers returned in the forest last spring for the first time in 15 years, they were "shocked because revegetation seems to have stopped" after the first five years following exposure.

Pine trees within about 25 yards of a radiation machine, invented for the experiment, were killed. Some browned and died before the eight-day exposure was completed, he said.

Farther away from the radiation source, some trees died after several years, some became sterile and some develnped three or four trunks after buds on top of them were killed, McCormick said.

The amnunt of radiation emitted during the eight days was more than six times the amount that scientists estimate would kill a human, he said.

Researchers monitnred the forest for the first five years after it was exposed, and recovery seemed tn be progressing normally, McCormick said

"Initial recnvery was rapid and predictable," he said. "Honeysuckle and trumpet vines began moving in. It was expected that pine seedlings would move in next to replenish the site. That didn't happen."

The weeds may have grown thicker because of the radiation and may have cut off light, so the seedlings couldn't grow, he said. Or the trees might not have been able to reproduce.

"Maybe there is more uncertainty about the ecological effects of radiation" than scientists thought 20 years ago, he said. "We need to reduce that uncertainty."

Other sites on federal land were tested in the mid-1960s, McCormick said. They include a mountain rain forest in Puerto Rico, a forest in Rhinelander, Wis., and a forest at the Department of Energy's Oak Ridge National Laboratory, about 25 miles west of Knoxville.

ATTACHMENT 5.

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PHYSIOLOGICAL AND MORPHOLOGICAL RESPONSES OF *PINUS STROBUS* L. AND *PINUS SYLVESTRIS* L. SEEDLINGS SUBJECTED TO LOW-LEVEL CONTINUOUS GAMMA IRRADIATION AT A RADIOACTIVE WASTE DISPOSAL AREA

K. R. CHANDORKAR and G. M. CLARK
Departments of Botany and Zoology, University of Toronto, Toronto, Ontario, Canada, M5S 1A1

(*Received* 5 *August* 1985; *accepted in revised form* 19 *November* 1985)

CHANDORKAR K. R. and CLARK G. M. *Physiological and morphological responses of* Pinus strobus *L. and* Pinus sylvestris *L. seedlings subjected to low-level continuous gamma irradiation at a radioactive waste disposal area.* ENVIRONMENTAL AND EXPERIMENTAL BOTANY 26, 259–270, 1986.—About 100 one-year old *Pinus strobus* and *Pinus sylvestris* seedlings were placed at the Welcome Residue Site (WRS), a radioactive waste disposal area located near Port Hope, Ontario, and thereafter continuously exposed to an average gamma dose rate of 10.15 mR/hr. An additional 100 seedlings were placed at a nearby control site where the background dose rate was about 0.03 mR/hr. Seedlings from both locations were sampled on three occasions for the analysis of various parameters. Data collected at the end of the growing season show that, although the low-level continuous irradiation treatment had not affected the chlorophyll content of the new needles of both species, it had suppressed their normal rates of apparent photosynthesis by about 16–19% and respiration rates by about 14–23%, and had reduced 80% ethanol soluble sugar content by about 14–25%. This treatment also suppressed stem elongation which led to considerable crowding of new needles and stimulated the outgrowth of lateral branches. These results suggest that both the morphological responses exhibited by the irradiated seedlings and the changes observed in the physico-chemical parameters of their needles were intermediated by the effect of continuous irradiation on the level of free auxin, IAA.

INTRODUCTION

WELCOME Residue Site (WRS) is one of several radioactive waste disposal areas maintained by Eldorado Nuclear Ltd in the immediate vicinity of Port Hope, Ontario. This area was used between 1948 and 1953 as a depository for radioactive wastes resulting from the extraction of radium from uranium ores. The refining of radium was terminated towards the end of 1953 and, for the next two years, this area was mainly used to bury the dismantled parts and machinery of the radium laboratories. Presently it occupies a fenced-in area of about 30 hectares, of which the somewhat central, and also fenced, 5.1 hectares constitute the main radioactive waste disposal area.

We first visited the WRS in the summer of 1976 to survey the types of vegetation growing within and around its perimeter and to ascertain the impact, if any, on the surrounding environment. During this visit we found that the site was mostly colonized by a variety of grasses, mosses and weedy dicot species (Fig. 5). Radiation exposure rates in different parts of the site varied considerably, ranging from as low as 0.3 mR/hr in areas with thick vegetative cover to as high as 100 mR/hr around a few barren spots. We also noticed a row of 10-year-old Scotch pine (*Pinus sylvestris* L.) trees growing along a drainage ditch

ATTACHMENT 6.

which flanks the southern border of the inner fence (Fig. 1). A closer examination of these trees indicated that, not only their normal growth and development was suppressed, but also that they exhibited a variety of anomalous growth responses such as witches' brooming, needle fusion and marked thickening of stems and needles (Figs 2 and 3). Other than these modifications, the trees did not exhibit nutritional deficiency or chemical toxicity symptoms as judged by the coloration of needles, in spite of the fact that the soil was known to be heavily contaminated with heavy metals such as arsenic, uranium and thorium. Gamma exposure rates in the vicinity of these trees ranged from about 0.3 to 1.2 mR/hr, which suggested that the total dose which they had accumulated in nine years at this site was approximately 25–100 R.

Symptomatic of radiation damage as these responses were, it was not clear at this time whether they were induced by (1) continuous low-level external gamma radiation, or (2) low-level internal alpha and beta irradiation from the absorption of alpha-emitting nuclides and their decay products, or (3) the combination of both.

Evidence that these responses may not have been caused by internal alpha and beta irradiation or by arsenic toxicity was provided by subsequent investigations. Using the technique of activation analysis, it was found that in aqueous extracts of several soil samples taken from the base of these trees the concentration of the alpha-emitting nuclides and arsenic was well below the level that is considered toxic to plants, and that the content of each of these elements in the stems, needles, cones and seeds of these trees was essentially comparable to similar tissues of trees growing at a nearby uncontaminated site. Although these analyses suggested that anomalous growth responses exhibited by these trees may have been induced by low-level continuous gamma irradiation, such a possibility appeared unlikely because reference to literature suggested that continuous gamma irradiation at such dose rates (i.e. 0.3–1.2 mR/hr) should have had little effect on the growth and development of these trees, even after several years of exposure.[19] It was therefore concluded that further assessment of the phenomenon was warranted and, hence, this study was initiated.

While this study was well under way, in the summer of 1981 Eldorado Nuclear Ltd initiated work to retop the WRS with uncontaminated soil in order to reduce further deterioration through wind and water erosion. When this work was completed towards the end of 1982, the background dose rate over most of the area was reduced to about 2–2.5 mR/hr and that in the vicinity of the border trees to about 0.03–0.05 mR/hr. Since then, most of the *Pinus sylvestris* trees have been growing at a much faster rate than that which they exhibited before 1981 (Fig. 4), indicating that continuous external gamma irradiation with an average dose rate as low as 1 mR/hr could have suppressed the growth and development of these trees.

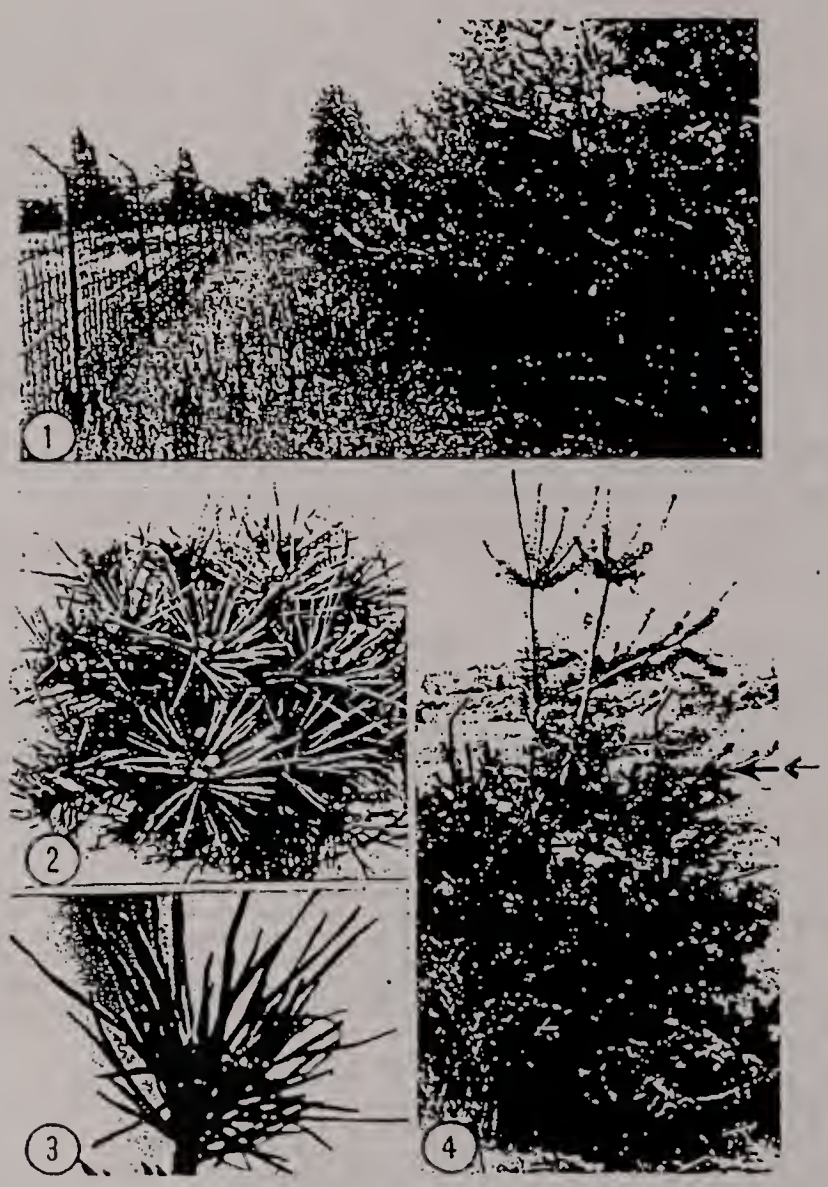
METHODS

Plant material

One-year-old *Pinus strobus* L. (white pine) and *P. sylvestris* L. (Scotch pine) seedlings were obtained from the Ontario Ministry of Natural Resources Nursery in Orono, Ontario. About 250–300 seedlings of each species were lifted from their seed-beds before budbreak and brought to the Department of Botany, University of Toronto, along with a sufficient amount of their seed-bed soil. From these lots about 100 seedlings of each species were selected for uniformity in height and these were transplanted into styrofoam cups using the Orono nursery soil. They were then fertilized with 'heavy' phosphate nutrient solution (N : P : K–10 : 50 : 10, Plant Products Co. Ltd, Bramalea, Ontario) and transferred to two adjacent cold frames in an outdoor lot where they were maintained for 10–15 days under diffused light and watered as required. Seedlings of *P. strobus* and *P. sylvestris* were transplanted and transported to the WRS at Port Hope, Ontario on 16 May 1978 and 8 May 1979, respectively.

Experimental arrangement and dosimetry

Of the total number of seedlings of each species taken to Port Hope, half was transferred to a wooden platform (height 30.5 cm, width 40.7 cm and length 244 cm) which was placed near the eastern inner fence of the WRS (Figs 5 and 6). The remaining were transferred to a similar



Figs 1–4. Photographs of *P. sylvestris* trees growing at the Welcome Residue Site. Fig. 1. A row of 11-year-old *P. sylvestris* trees growing along the southern edge of the inner fence of WRS Taken 1978. Fig 2. Branch showing a witches' broom type of growth resulting from suppression of main-shoot extension and outgrowth of lateral buds. Fig. 3. Branch showing thickened stem, abnormal (fused and thickened) needles and reduced stem elongation. Fig. 4. Tree showing marked changes in growth pattern after WRS was covered with uncontaminated soil in 1981, lowering the dose rate to 0.03 to 0.05 mR/hr. Arrow marks height at which 1981 growth began.

PERSONAL EXPERIENCES

&

OBSERVATIONS OF

PLANT GROWTH ABNORMALITIES

IN

NORTH WEST QUADRANT

OF

THREE MILE ISLAND

Mary Osborn
1/14/85
(revised & corrected 2/85)

(21 pages follow)

ATTACHMENT 7.

PERSONAL EXPERIENCES & OBSERVATIONS OF PLANT GROWTH ABNORMALITIES IN NORTH WEST QUADRANT OF THREE MILE ISLAND

Since the spring of '79, I have observed, collected and photographed abnormal growth of flora in the areas around Three Mile Island. Regardless, or in spite of the arguments of how much radiation did or didn't get out, if chemicals were released, or even a combination of both - these are my findings and experiences since the early days of the TMI accident.

First I will restate some of my experiences (I will not get into the reports of farm animals & pets, birds, insects or bumble bees dying or disappearing following the accident). I live in the northwest quadrant of TMI, in Swatara Township, approximately 6½ miles away from the plant. Between Harrisburg and Three Mile Island (near the Host Inn, see: NUREG 0600, figure II-3-6).

On Wednesday, 3/28/79 at six o'clock in the morning, my husband and I were outdoors. We had a clean metallic taste at that time. (Our taste was not coppery or rusty or like burning galvanized steel as others have reported) My son and I were outdoors from 7:45 am to 10:00 am; later that day we both had sunburn effects on our hands and faces.

Thursday, 3/29/79, we drove to the west shore, to Ashcombe Vegetable Farm near Grantham, to just get-away for a while. During that drive I had tearing and burning of my eyes. It was so bright, it hurt to see. I did not connect the skin and eye burns to the accident, although we joked about the metallic taste sometime later as being vaporized metal from the accident.

Friday, 3/30/79 (or black Friday as we call it now) after hearing sirens, church bells and the radio news of uncontrolled radiation releases from Three Mile Island, we evacuated.

The next week, on Tuesday evening, my husband and I returned home for winter clothing, medicine and teddy bears. During our brief two hour trip home I encountered an "unusual event" - the problem I observed was the accelerated growth of my umbrella plant (genus cyperus). New growth, fresh green in color, had appeared - more than a 3" x 5" card within 5 days! (Friday to Tuesday)

We evacuated for eight days. Sometime later (I don't remember how many days), while giving my two year old a bath, I noticed a "small wad" of hair in the tub. His hair had thinned, you could see his scalp. (I think all of us in my family had some amount of hair loss and have met women from Middletown saying the same happened to them.)

That spring, one pinkish tulip had a petal growing 2" down on the stem. In the spring of 1980 that tulip "branched", it had two tulips on one stem. This has not occured since that time.

In May of 1979, my daughter picked a bunch of wild field daisies, with two grossly deformed flowers among them. I also found three dandelions in my back yard that appeared to be similarly deformed. I have found many of these every year since 1979. (My neighbor who lived here over 25 years had never

mary stamos osborn

-1-

observed this before. I have lived here since 1969 and had never observed this either, anywhere).

In the fall of '79, my children picked up leaves from the front yard, to do crayon "rubbings". The leaves would not fit under a sheet of 8½" x 11" paper. One leaf would not fit where two or three used to.

I have also found abnormalities on the west shore, in the areas of the Aamodt Health Study. The plants were found easily by observing shapes or colors that weren't normal.

In May of '84, Marjorie Aamodt and I took some of the specimens collected to a botanist, Dr. James Gunckel. He is the "world authority on modifications of plant growth and development induced by ionizing radiations". (See his affidavit attached, from the Aamodt Health Survey.) At that time Dr. Gunckel gave us two reprints of his research and mentioned clues as to what additional effects or symptoms to look for: thickening of leaves, leathery leaves, unusual dwarfing, multiple leaf axils (stimulations), reversion (vegetative-floral growth back and forth), etc.

To date, I have found plant abnormalities in these areas around TMI: Londonderry Township, Derry Township, Lower Swatara Township, Fairview Township, Harrisburg, Newberry Township, Swatara Township and Upper Allen Township. The plants I've found are: daisies, dandelions, chrysanthemums, pyrethrum, sunflower, forsythia, marigolds, crown vetch, maple leaves, redbud leaves, rose leaves, queen anne's lace, corn tassels, some common weeds and a few others. Also, very unusual growth patterns on two pine trees and dandelion leaves 31" long. (see list and sketches attached)

I cannot say "all" abnormalities found were caused by radiation or chemicals from the Three Mile Island accident, but I believe the fallout from the accident has caused most of the effects I've seen.

..The fact that abnormalities are being found 5 years after the accident raises serious questions.....

Is there something in the soil <u>now</u> that is causing these effects? Is the plant releasing enough from clean-up or Unit 1 testing to cause this now? Has the Chinese Bomb Fallout and weapons testing combined with years of continuous radiation releases from TMI done irreversable harm to our environment? To our babies, children or families? To our animals, plants, water, air and earth? What Environmental Impact Statement ?

A key point to make is the finding that these abnormalities, modifications, or mutations occured in the same areas where people have reported having the metallic taste, skins burns, and other accident related symptoms. We have found people, animal and plant effects in the same areas where symptoms were reported at the time of the Three Mile Island nuclear accident. They have been discounted by some "experts" but not all. The fact is there is still no other explanation to these terrible effects. Everything I've found seems to tie into the accident and the more one learns the more this seems to be true.

-2-

GLOSSARY

ADVENTITIOUS BUDS: Buds formed where it shouldn't be, from tissues that shouldn't form a bud.

AXIL: Angle between leaf or leafstalk and the stem that carries it. Any new growth or flower bud that arises from an axil is called axillary.

BLIND SHOOT: Where normal tip of shoot that would normally have leaves or flower, but it doesn't; it just forms a long shoot tip without leaves or flowers.

BUD: A condensed shoot, often protected by overlapping scales. A growth bud contains embryo leaves. A flower bud contains embryo flowers or flower clusters.

CHLOROSIS: A condition in which leaves become unnaturally pallid, whitish or yellow. Usually due to lack of essential minerals.

DIFURCATION: Branching into two.

FASCIATION: Multiple stems from multiple buds.

MARGIN: The edge or boundary of any plant organ - most often applied to the border area of a leaf. (margin deformity see Redbud leaves.)

MORPHOGENETIC ABNORMALITIES: Form abnormalities.

VACUOLATION: Formation of a largely water filled cell.

Abnormalities have been observed in the following areas around Three Mile Island since the spring of 1979:

LOCATION CODE* (see following page)

OT	DERRY TOWNSHIP	LST	LOWER SWATARA TOWNSHIP
E	ETTERS	M	MECHANICSBURG
FT	FAIRVIEW TOWNSHIP	NT	NEWBERRY TOWNSHIP
H	HARRISBURG	O	OBERLIN
L	LISBURN	ST	SWATARA TOWNSHIP
LT	LONDONDERRY TOWNSHIP	UAT	UPPER ALLEN TOWNSHIP

note-

There have been other reports of strange or unusual plant growth in the TMI area since the accident. Abnormalities are not limited to locations mentioned here. My observations are up to the period of January 1985 and have been found as far as 15 miles from Three Mile Island. In many instances the findings seem to follow the "plume" pathways as evidenced by the reports of exposure at time of the accident by human dosimeters.

Abnormalities/mutations occur in nature, it is the frequency of these occurences that merits attention and concern.

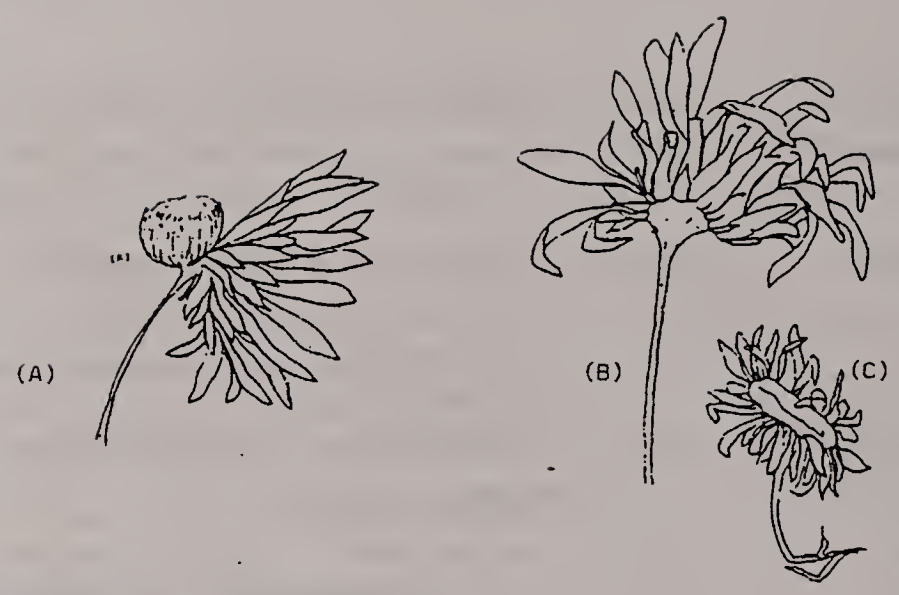
-3-

OBSERVATIONS

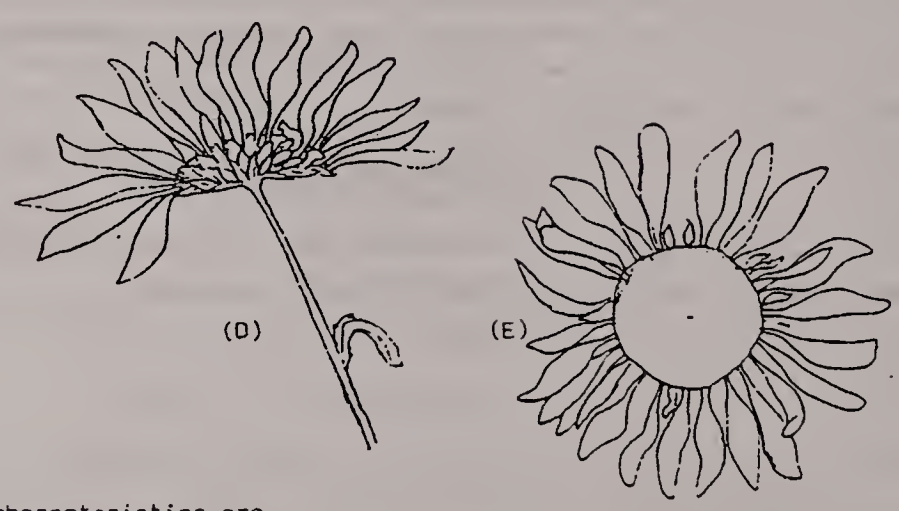
TYPE OF PLANT	LOCATION*	ABNORMALITY OBSERVED
CHRYSANTHEMUMS	UAT	MULTIPLE BUDS.
CORN	DT, E	SEX REVERSAL.
CORNFLOWER	ST	WHITE, SHOULD BE BLUE (CHLOROSIS?).
CROWN VETCH	ST	CHLOROSIS (FRENCH VANILLA COLOR).
DAISY	E, ST	STEM FASCIATION, ~~MULTIPLE BUDS,~~ AXILLARY FLOWER HEAD.
DANDELION	E,ST,O,H,M	DEFORMED FLOWER HEADS, MULTIPLE BLOOMS.
DANDELION LEAVES	FT	HUGE, 31" LONG.
FORSYTHIA	E, LST	MULTIPLE BUDS.
MAPLE LEAVES	E,L,ST,LST	MARGIN ABNORMALITY, THICK & LEATHERY, PUCKERED, CHLOROSIS, SOME DWARFED, SOME HUGE.
MAPLE TREE	ST, FT	BLIND SHOOTS, EXCESS SEEDS (WOULD NOT SPROUT).
MAPLE TREES	LST, ST, FT	DEAD AREAS ABOUT 15' IN DIAMETER AS IF "PLUME" WENT THRU.
MARIGOLDS	FT	STUNTED, STEM FASCIATION, NO FLOWER PETALS, ALL FLORETS, LEATHERY LEAVES.
ONION/GARLIC WEED	ST, LST	REVERSION.
PINE TREES	E, ST	UNUSUAL GROWTH PATTERN FOR PINE CONES, UNUSUAL MASSIVE GROWTH.
PYRETHRUM	ST	STEM FASCIATION, THICK LEATHERY LEAVES.
QUEEN ANNE'S LACE	ST, LT	PINKISH FLOWERS, WOODY STEM.
REDBUD LEAVES	ST	MARGIN ABNORMALITIES.
ROSE	LST	WHITE ROSE ON ALL YELLOW BUSH.
ROSE LEAVES	LST, ST	LEAF FUSION, STUNTING, CHLOROSIS, AXILLARY BUDS FORMED.
SPIDERWORT	NT,ST	EXTRA PETALS & STAMENS.
SUNFLOWER	E, L, ST	STEM FASCIATION, AXILLARY BUDS.
YELLOW BUSH TYPE WEED	ST	WRONG COLOR (CHLOROSIS?).

*see previous page for location code

-4-



(A) AXILLARY FLOWER HEAD
(B) STEM FASCIATION
(C) DEFORMED INFLORESCENCE, TOP VIEW
(D) NORMAL SIDE VIEW
(E) NORMAL TOP VIEW



(Shape and form characteristics are similar in dandelion, sunflower, chrysanthemum and daisy)

5/84

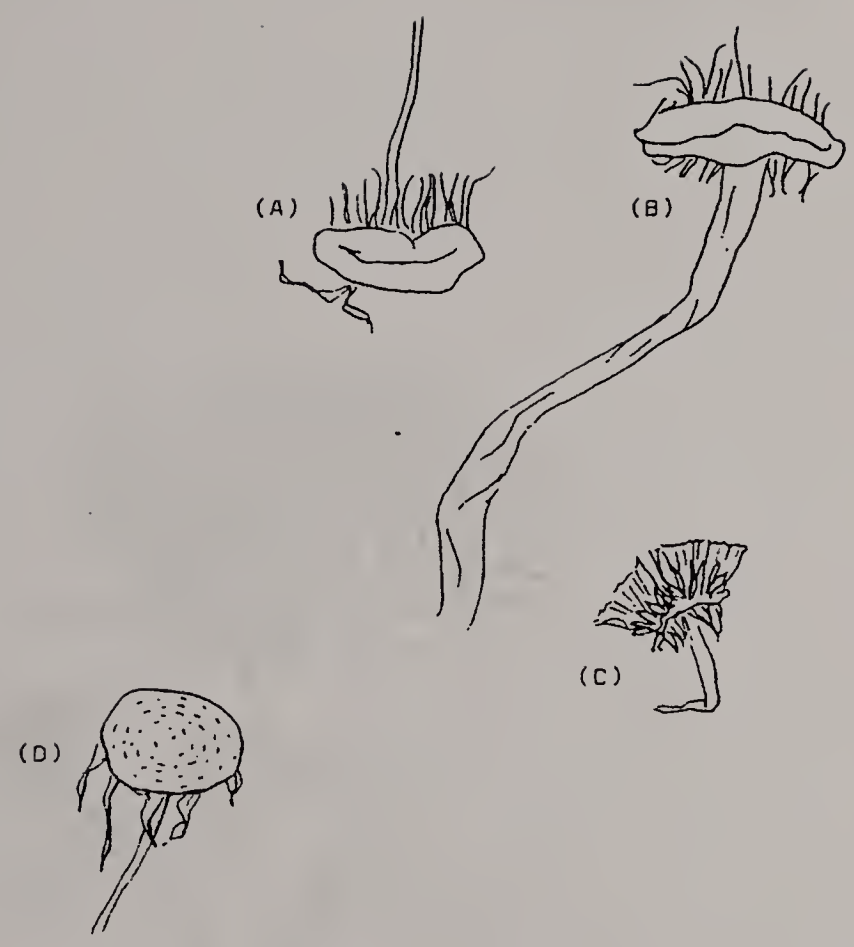
Swatara Twp, Etters

area-

FIELD DAISIES

-5-

A,B,C, CLOSE TO ACTUAL SIZE
D, ENLARGED



A, B, 5/82 OBERLIN
C, 7/82 HARRISBURG
D, 8/84 SWATARA TWP.
AREA

(A)(B) DEFORMED FLOWER HEAD
(C) DOUBLE BLOOM
(D) NO DEFORMITY
DANDELION

-6-

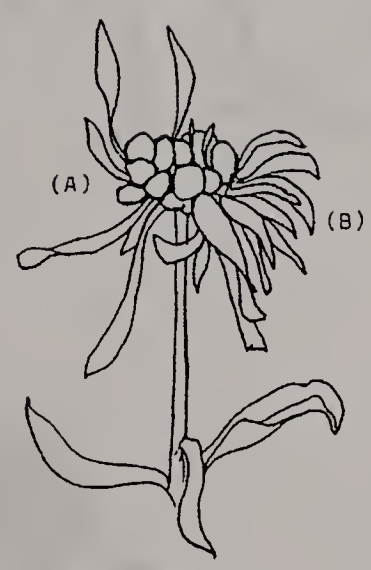
CLOSE TO ACTUAL SIZE

9/84
SWATARA TWP.
AREA

NO DEFORMITY
CHRYSANTHEMUM

-7-

CLOSE TO ACTUAL SIZE



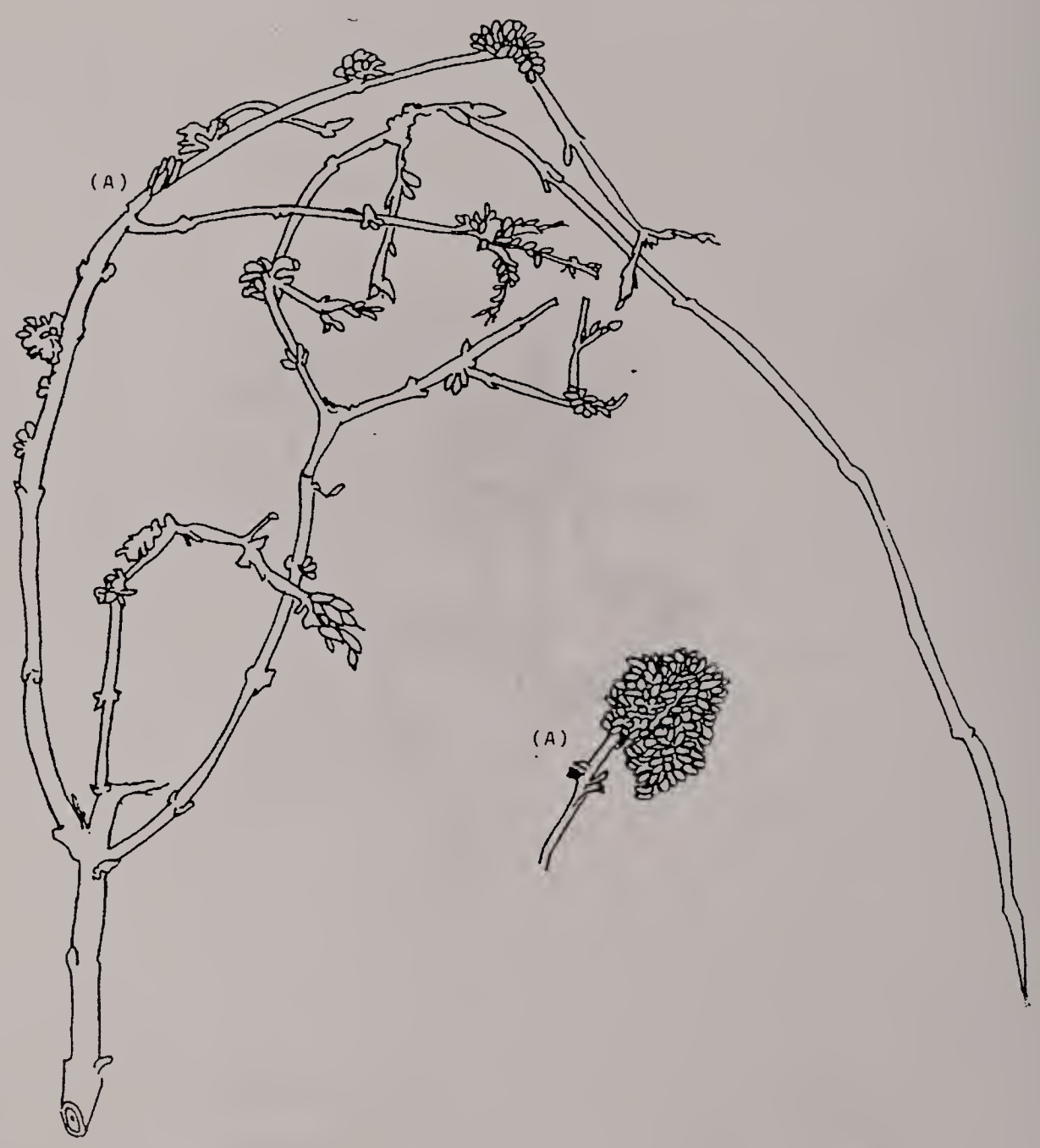
9/21/84

about 14 miles n/w
AREA

(A) MULTIPLE BUDS
(B) PETALS
CHRYSANTHEMUM

-8-

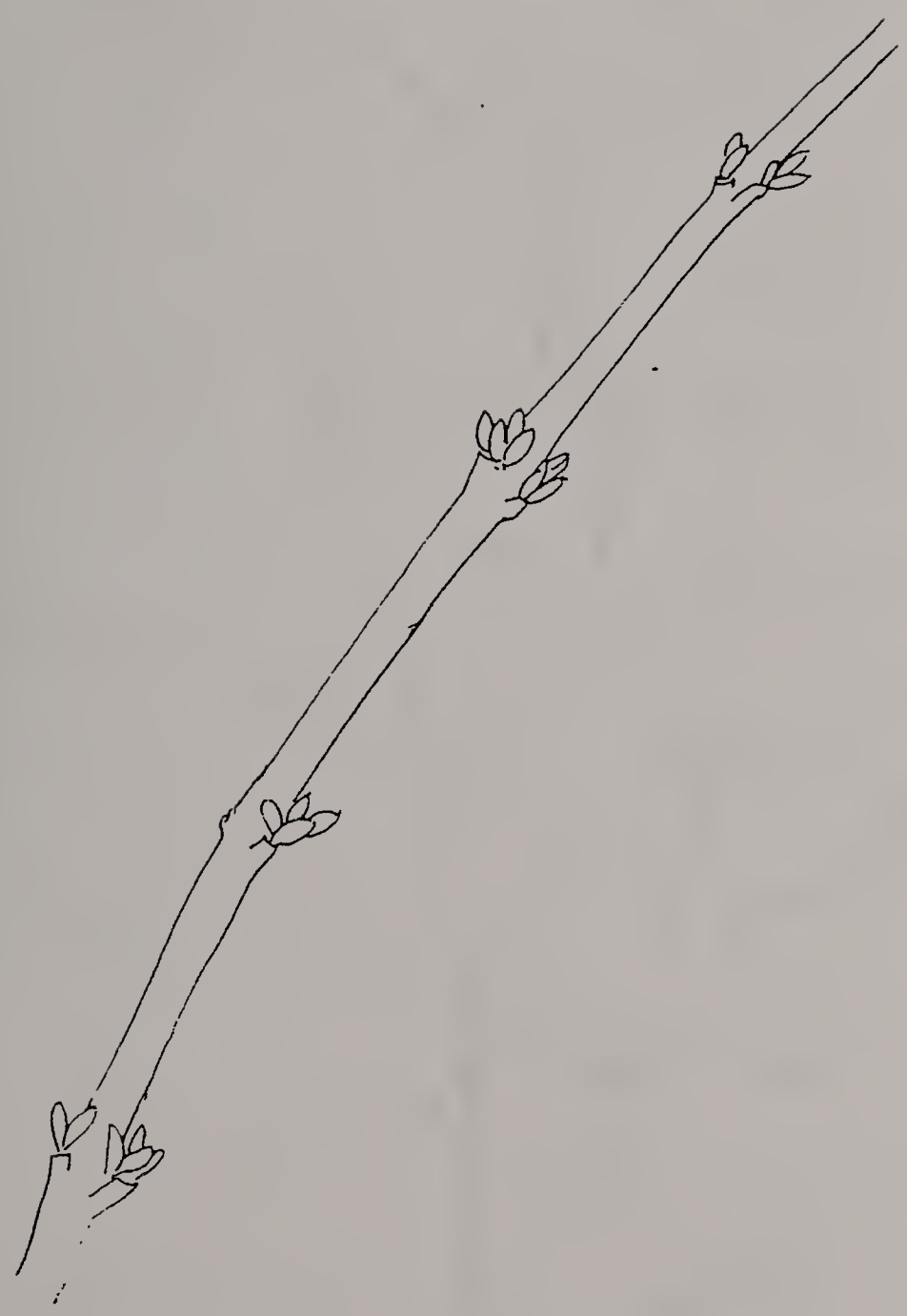
CLOSE TO ACTUAL SIZE



4/83
ETTERS
AREA

(A) MULTIPLE BUDS

CLOSE TO ACTUAL SIZE



1/2/85
SWATARA LOWER SWATARA LINE
AREA

NORMAL TWIG

FORS [illegible]

-10-

ACTUAL SIZE
(A)
(A)
7/18/3-
SWATARI TWP.
MARGIN DEFORMITY
(A)CENTER LOBE NOT DEVELOPED
-11-

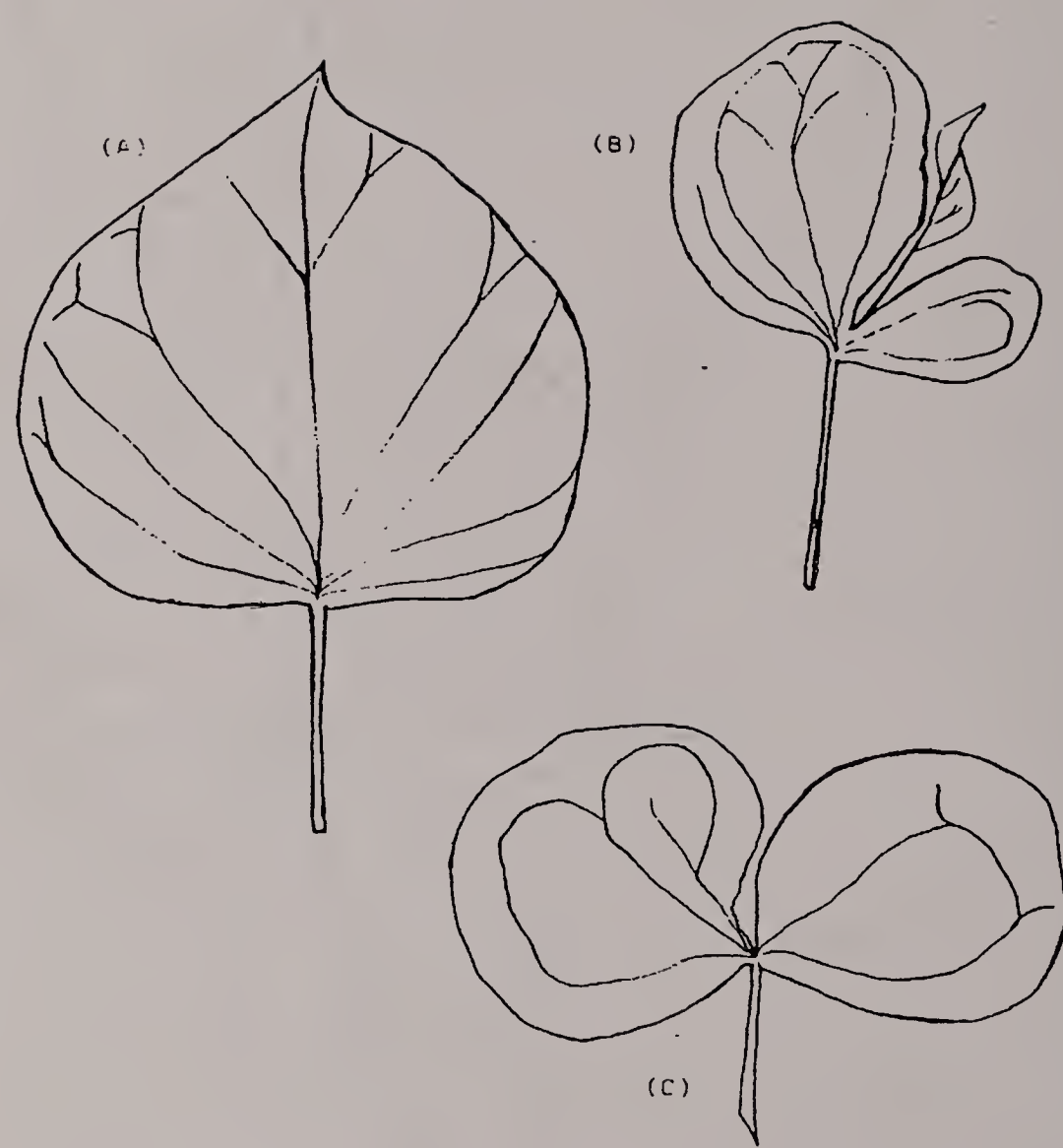
ACTUAL SIZE

10/84
SWATARA TWP.
AREA

NO DEFORMITY
MAPLE LEAF

-12-

ACTUAL SIZE

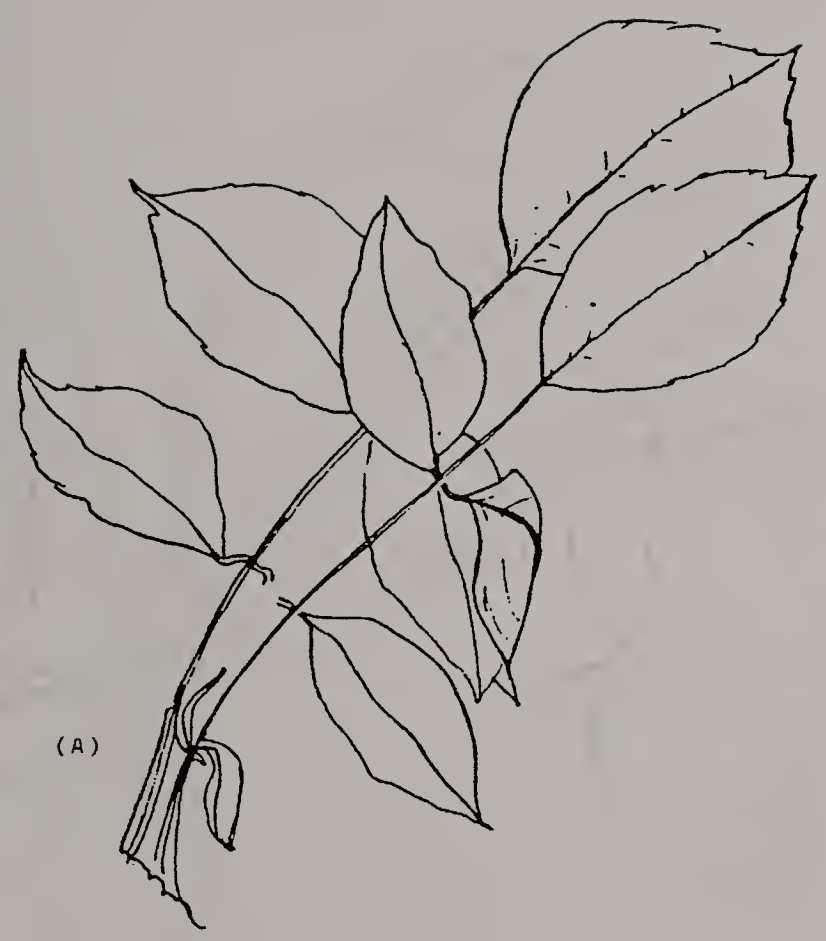


7/84
SWATARE TWP.
AREA

(A) NO DEFORMITIES
(B)(C) MARGIN DEFORMITIES
REDBUD LEAVES

-13-

ACTUAL SIZE



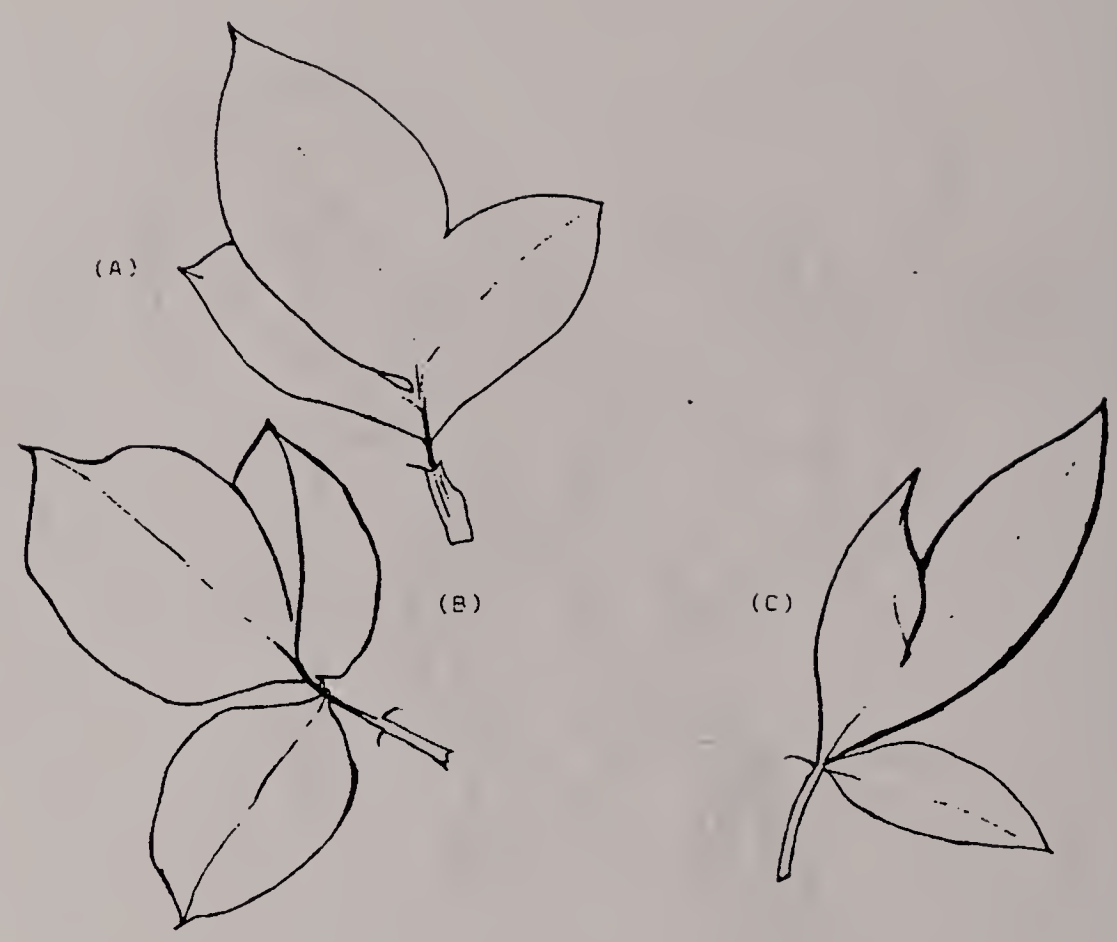
(A)

7/84
SWATARA TWP.
AREA

(DECAPPED? & THEN)
AXILLARY BUDS DEVELOPED
BLAZE ROSE BUSH

-14-

CLOSE TO ACTUAL SIZE



6/84
A, B, LOWER SWATARA
C, SWATARA TWP.

FUSED LEAVES
ROSE BUSH

-15-

SEX REVERSAL (MALE TASSEL
PRODUCING FEMALE CORN)
TASSEL OF CORN

9/84, 8/82
ETTERS, HERSHEY R.D.
AREA

REVERSION

WILD GARLIC/ONION WEED

9/82
SWATARA, LOWER SWATARA
AREA

-16-

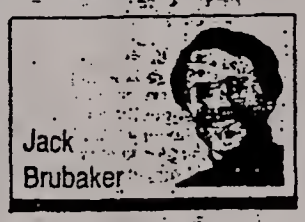
The Scribbler

Boy George Corn

Another Agricultural Oddity of the Season

We have reported on a few of the weird plants that issued from this most abundant of growing seasons, and we now have the 1984 garden winner. The envelope, please, Mellors.

And the winner is: sexually confused corn. This has been a ripe year for what ordinarily is a rare abnormality: tassels producing their own ears.



Lou Gable, a deputy game warden of Columbia R2, spotted some of this strange corn on a Mountville-area farm not long ago. He informed Penn State extension agent Arnold Lueck. Lueck has since heard about several other outbreaks.

A brief explanation for city slickers: Corn is bisexual. The tassel is the male organ. The ear is the female organ. The tassel sheds pollen on the ear, and the ear makes baby kernels.

That's what happens under normal circumstances. Abnormally, on rare occasions, male tassels change sex and produce their own miniature ears with kernels — as if they didn't need the regular ears at all.

Nobody knows precisely why this happens, Lueck says. All is speculation, especially this year when the abnormality is relatively widespread.

"The affected plants likely experienced some kind of environmental shock," he notes, "as extreme cold or a virus infection. Such conditions have been known to produce sex changes in corn plants."

Corn tassels that gave birth to their own ears

The corn Gable spotted, and which is pictured here, is field corn. Lueck says he has also seen the aberration in sweet corn. (The Scribbler once spied a mirage with one white, sequined glove dancing in his bowl of corn flakes, but we're not going to develop that theme.)

Lancs 10/84

55 lb mushroom

Record find?

Ermo and Donald Croce of Hershey hope their find will mushroom into a record breaker. The couple pulled the 55-pound specimen from a stump in a field along Route 322 just east of Hershey yesterday. They plan to have the mushroom — which they claim is edible — weighed and measured at Lebanon Valley College before submitting statistics for possible inclusion in the Guinness Book of World Records.

-18-

19.

Below are excerpts from the booklets Dr. Gunckel gave us. This explains why even knowledgeable people have difficulty in accepting the fact that radiation damage occurred in the plants around TMI.

> Most of the radiation effects described are quantitatively rather than qualitatively different from those known to occur in unirradiated plants. (273)
>
> You have nothing that is not known in nature - you seem to be speeding up the frequency of these events. (279)
>
> Most, if not all, radiation induce effects are teratological responses observed in nature, but the frequency of such events is markedly accelerated. (373)
>
> A large variety of leaf anomalies has been noted in irradiated plants. In any given species, one or more of the following changes may appear; dwarfing, thickening, roughened or uneven texture, puckering of blade, curling of leaf margins, distorted venation, fusions, cup-shaped or tubular leaves, color changes, and premature abscission. (272)
>
> Irradiated flowering plants may show: increased height, thickening & fasciation of floral stalks, delayed and/or reduced flowering, premature or increased flowering, color changes and somatic changes, or high degree of sterility and modification in form and number of floral parts. (597)
>
> Fasciation of stems, while not uncommon in unirradiated plants occurs so frequently in irradiated plants that it may be considered a typical radiation effect. (375)
>
> It should be emphasized that the results for one species should not be extrapolated to another, as the responses of different species or even different forms or varieties within a species may vary. (595) An example was given-if you have an apple orchard with many different kinds of apple trees, and they were all exposed to equal doses of radiation, some trees could be injured while other trees are unaffected.

Dr. Gunckel and Dr. Sparrow wrote in 1961, "it is obvious that the naturally occuring ionizing radiations were producing their biological effects since time immemorial, and that the cumulative effects of these radiations might conceivably be of considerable evolutionary significance. The recent concern over small increases in background radiation due to radioactive fallout reflects the opinion of many biologists that an increase in the background level of radiation, if continued over long periods of time, may produce significant biological effects, mainly genetic."

p.19

Publications of James E. Gunckel

IV. The Effects of Ionizing Radiation on Plants: Morphological Effects, The Quarterly Review of Biology, Vol 32, No. 1, March 1957

Modifications of Plant Growth and Development Induced by Ionizing Radiations, Encyclopedia of Plant Physiology, Vol XV/2, 1965

Aberrant Growth in Plants Induced by Ionizing Radiation, with Arnold H. Sparrow, Abnormal and Pathological Plant Growth, Brookhaven Symposia in Biology No. 6 (1954)

Ionizing Radiations: Biochemical, Physiological and Morphological Aspects of their Effects on Plants, with A. H. Sparrow, Encyclopedia of Plant Physiology, Vol XVI, 1961

note: I met Dr. Gunckel on 5/5/84 at his home in N.J. 3 items he mentioned at that time were: • "all studies ever done on levels below 35 R is exactly 2 studies." (plant studies)
• "The real danger is the food chain."
• the "Body can't get rid of heavy metal - gathers in fatty tissues in animals."
(the above is from some of my notes of that visit.)

-20-

The Bulletin
of the Torrey Botanical Club

Editor-in-Chief: James E. Gunckel

[illegible]
Bridgewater, NJ 08807
(201) 526-1296

May 11, 1984

AFFIDAVIT 9

I have carefully examined a few specimens of common plants collected shortly after the accident at TMI and compared them with specimens collected more recently. The current abnormalities are probably carried forward by induced chromosomal aberrations. There were a number of anomalies entirely comparable to those induced by ionizing radiation -- stem fasciations, growth stimulation, induction of extra vegetative buds and stem tumors.

Most of the stem abnormalities described in the literature, and in my own experience, are induced by relatively high doses of X or gamma rays extending over a period of usually 2-3 months. Notable exceptions, however, are similar responses to beta ray exposure from radioisotopes (P^{32}, Zn^{65}, Ca^{45}) and for only 24 hours. In other words, it would have been possible for the types of plant abnormalities observed to have been induced by radioactive fallout on March 29, 1979.

3/29/79 - 3 Rem Release

In discussing the general biological effects of irradiation, some clarification may be helpful. In plants, the dose rate (e.g., mr/hr) is much more important than total dose (e.g., mr/yr) in inducing abnormalities. Further, the "quality factor" for gamma and beta radiation is not the same as generally assumed. In fact, I have incontrovertible experimental results to show that beta rays are at least a quality factor of two in plants.

I am the world authority on modifications of plant growth and development induced by ionizing radiations, having researched this area for 34 years at the Brookhaven National Laboratory and at Rutgers University. The three review papers appended attest to my expertise.

James E. Gunckel
James E. Gunckel

P.21.

Sunday Patriot-News
HARRISBURG, PA., OCTOBER 6, 1985

ATTACHMENT 8. END.

State's TMI study clouded by survey method doubts

By Frank Lynch
Sunday Patriot-News

The state's recently released study of health effects of the 1979 Three Mile Island accident may have been flawed by expanding the survey areas beyond the prescribed five- and 10-mile zones.

According to 1980 census figures, the state Department of Health included 28,610 people who live farther than five miles from the Londonderry Twp. plant in the population listed for those who live within five miles.

Another 122,000 people who live farther than 10 miles from the plant were included in the population of those living "within" 10 miles.

THE RESULT, according to epidemiologists and statisticians contacted by the Sunday Patriot-News, is that if there actually were adverse health effects such as increased cancer cases among those living close to the plant, the figures would be diluted by expanding the base population.

"It seems like a strange thing to do," said Dr. Robert A. Hultquist, Pennsylvania State University professor of statistics. "I think you would substantially dilute [assumed cancer rates] to get even a few miles away."

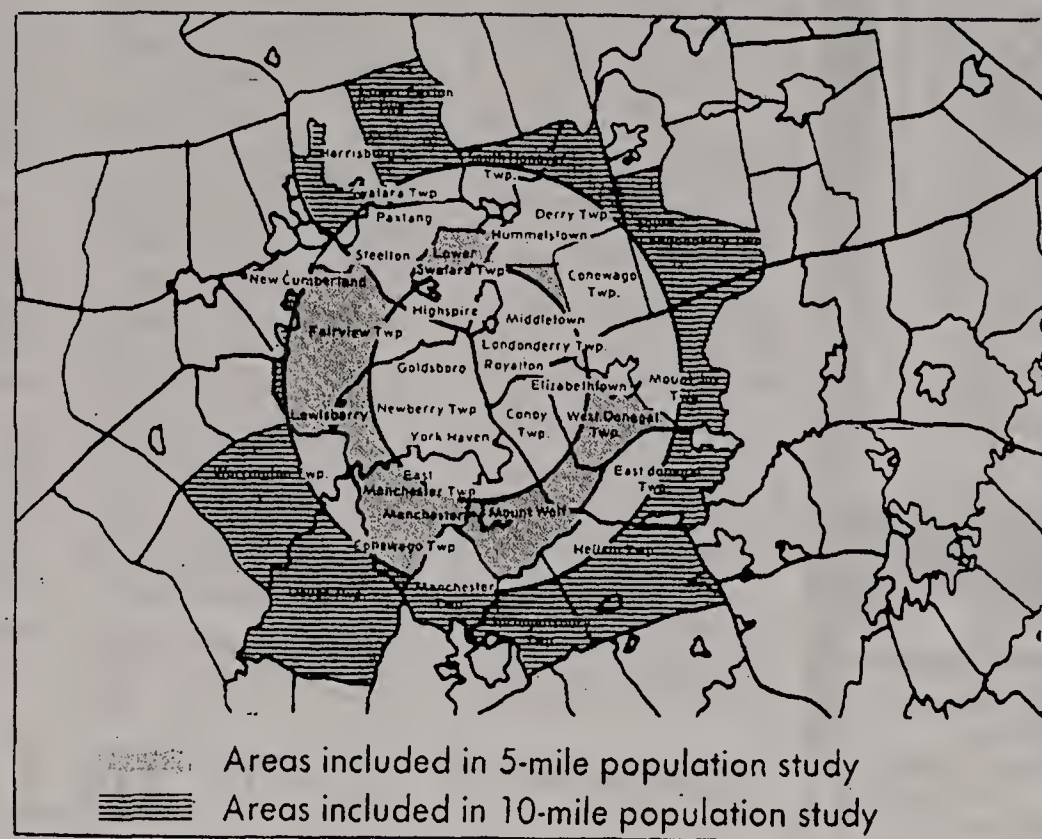
Dr. George Hutchison, Harvard professor of epidemiology, concurred.

"Let's suppose there is an excess cancer rate [in the five-mile zone], and not excess rate beyond the five-mile zone," he said. "The larger population would dilute the overall cancer rate."

THE STUDY, released a month ago, concluded that no adverse health effects had been found so far in people who live around TMI, site of the nation's worst commercial nuclear accident on March 28, 1979.

Comparing census figures with the totals listed by the Health Department, 44 percent of the population figured in the five-mile statistics live outside that zone, while 42 percent of those said to be

See STATE'S—Page A10



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A10—Sunday Patriot-News, Harrisburg, Pa., October 6, 1985

State's TMI study clouded

From Page A1

"within" the 10-mile zone actually live farther away.

For example, all of Lower Paxton Twp.'s 34,830 residents were included in the 10-mile figures, although only 2,000 of them live in the sliver of the township inside the 10-mile radius. Some Lower Paxton Twp. residents live as far as 16 miles from the plant.

Health Department officials defend the way they gathered their data. They say the data were not diluted by the excess population included, and that the study could not have been conducted had they attempted to stay close to the imaginary 5- and 10-mile zones.

"IT WOULD be a tremendous job, almost humanly impossible" to conduct such a study, said Edward Digon, principal author of the report and chief of the department's special studies section, division of epidemiology research.

Digon said the report should have noted that some of the people included in the study live outside the zones. Such a notation had been included in an early draft that he wrote, but was deleted during the editing process. Leaving the explanation out, he said, was an "error."

But Digon stressed that there was not an increase in cancer. He said the four communities entirely within the five-mile zone had about the same number of cancer deaths as would have been expected.

Health Department spokesman Bill Lindeberg said, "We think we have a pretty solid report, and we stand on it."

TMI'S UNIT 2 reactor overheated and released some radioactivity into the environment in March 1979. Government experts and scientists have said not enough radiation escaped to trigger any significant health problems.

But doubts have persisted over the last six years.

Norman and Marjorie Aamodt, formerly of Chester County, and now of Lake Placid, N.Y., conducted a study last year that concluded the number of local people dying from cancer increased sevenfold since the accident. on 3 streets.

Meanwhile, the Columbia (N.Y.) University Department of Epidemiology is conducting a two-year, $420,000 study of pregnancy outcomes and cancer rates since the accident.

And the Health Department will continue to monitor cancer cases in the area for future studies.

THE MOST recent study was made to find out what, if any, health effects were suffered by residents living certain distances from the plant. Five- and 10-mile zones were selected for comparison purposes.

Digon noted that death certificates and cancer incidence information from the state's Cancer Registry are available according to "minor civil division" — or by township and borough.

Since the minor civil divisions do not align with the five- and 10-mile circles, officials included all of a division in the study even if only part of it is within the described zone. neither do twp's.

Digon said it was decided to use the divisions — even though their use inflates the population numbers — because it will be easier to conduct follow-up studies.

"YOU COULD do it [try to divide the divisions to stay close to the zone circles]. But you can't do that for too many years because the reference books [needed to keep track of residents] would fill up a room," he said. ?

Therefore, he said future comparison studies also will include those living outside the zones.

Harvard's Hutchison said that to do a study expeditiously, "there is a good argument for using townships and boroughs rather than using areas defining a circle around Three Mile Island."

But he said that that study method should have been described in the report. "If there is not any footnote [explaining that some areas are actually not within the described zones], then you have a problem."

AND-PADOH already had a 5mile population base study.

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Anti-nuclear protests spread

PARIS (AP) — About 3,000 people, chanting to the strains of accordion music, marched through Paris on Monday to protest France's resumption of nuclear test blasts in the South Pacific.

Several hundred anti-nuclear protesters also demonstrated Monday in Orleans in central France, Rennes in the west, and Poitiers and Agen in the southwest.

The protests were small by French standards, involving far fewer people than the typical union, student or other anti-government demonstration. But they were still one of the largest shows of opposition yet in France to nuclear testing.

9-12-95 Intell Lanc.

Appendix B

Contributors to the Supplement

Appendix B

Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations, Earth Tech, Inc. and Information Systems Laboratories, Inc.

Name	Affiliation	Function or Expertise
	Nuclear Regulatory Commission	
Alicia Williamson	Nuclear Reactor Regulation	Environmental Project Manager
Robert Schaaf	Nuclear Reactor Regulation	Technical Monitor
Rani Franovich	Nuclear Reactor Regulation	Branch Chief
Christian Jacobs	Nuclear Reactor Regulation	Project Management Support
Alicia Mullins	Nuclear Reactor Regulation	Project Management Support
Jason Flemming	Nuclear Reactor Regulation	Hydrology
Harriet Nash	Nuclear Reactor Regulation	Ecology
Dennis Logan	Nuclear Reactor Regulation	Ecology
Elizabeth Wexler	Nuclear Reactor Regulation	Ecology
Jennifer Davis	Nuclear Reactor Regulation	Cultural Resources
Jeffrey Rikhoff	Nuclear Reactor Regulation	Socioeconomics
Richard Emch	Nuclear Reactor Regulation	Radiation Protection
Andrew Luu	Nuclear Reactor Regulation	Radiation Protection
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Laurie Fleisher		Severe Accident Mitigation Alternatives

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Entergy Nuclear Operations, Inc.'s Application for License Renewal of Pilgrim Nuclear Power Station

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Entergy Nuclear Operations, Inc.'s Application for License Renewal of Pilgrim Nuclear Power Station

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Entergy Nuclear Operations, Inc. (Entergy) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of Entergy's application for renewal of the Pilgrim Nuclear Power Station (PNPS), operating license. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, MD, and are available electronically from the Public Electronic Reading Room found on the Internet at the following Web address: <http://www.nrc.gov/reading-rm.html>. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents in the publicly available records component of ADAMS. The ADAMS accession number for each document is included below.

January 25, 2006	Letter from Mr. Michael A. Balduzzi, Entergy, to NRC submitting the application for the renewal of the operating license for PNPS. (Accession No. ML060300026).
January 31, 2006	Letter from NRC to Mr. Michael R. Kansler, Entergy, regarding receipt and availability of the License Renewal Application for PNPS. (Accession No. ML060310593).
January 31, 2006	NRC press release announcing the availability of the license renewal application for PNPS. (Accession No. ML060310043).
February 6, 2006	Federal Register Notice of receipt of application for renewal of Facility Operating License No. DPR-35 for an additional 20-year period (71 FR 6101).
March 21, 2006	Letter from NRC to Mr. Michael Kansler, Entergy, regarding Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing regarding the Application from Entergy for Renewal of the Operating License for PNPS. (Accession No. ML060800745).

March 27, 2006	Federal Register Notice of acceptance for docketing of the application and notice of opportunity for a hearing regarding the application for license renewal of PNPS (71 FR 15220).
April 7, 2006	Letter from NRC to Mr. Michael R. Kansler, Entergy, regarding Notice Of Intent to prepare an Environmental Impact Statement and conduct Scoping Process for License Renewal for the PNPS (TAC NO. MC9676). (Accession No. ML061000261).
April 14, 2006	Federal Register Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process regarding the application for license renewal of PNPS (71 FR 19554).
April 21, 2006	Letter from NRC to Mr. Michael Bowland, Mashantucket Tribal Council Office regarding request for comments on the PNPS License Renewal Application Review. (Accession No. ML061170222).
April 21, 2006	Letter from NRC to Ms. Cheryl Andrews-Maltais, Wampanoag Tribe of Gay Head-Aquinnah, regarding request for comments on the PNPS License Renewal Application Review. (Accession No. ML061170152).
April 21, 2006	Letter from NRC to Mr. Sachem M. Thomas, Chief, Narragansett Indian Tribe, regarding request for comments on the PNPS License Renewal Application Review. (Accession No. ML061170085).
April 21, 2006	Letter from NRC to Ms. Jean McGinnis, Tribe Council, Mohegan Tribe, regarding request for comments on the PNPS License Renewal Application Review. (Accession No. ML061160613).
April 25, 2006	Letter from NRC to Mr. Peter Colosi, National Marine Fisheries Service, regarding request for a list of protected species and essential fish habitat within the area under evaluation for the PNPS License Renewal Application Review. (Accession No. ML061160283).
April 25, 2006	Letter from NRC to Mr. Michael Bartlett, U.S. Fish and Wildlife Service, regarding request for a list of the protected species within the area under evaluation for the PNPS License Renewal Application Review. (Accession No. ML061160303).
May 2, 2006	Letter from NRC to Mr. Don L. Klima, Advisory Council on Historic Preservation, regarding PNPS License Renewal Application Review. (Accession No. ML061240335).

May 11, 2006	Letter from NRC to Ms. Brona Simon, Massachusetts Historical Commission, regarding the PNPS License Renewal Application Review (SHPO No. RC36661). (Accession No. ML061310234).
May 22, 2006	Letter from NRC to Mr. Michael Kansler, Entergy, regarding Request for Additional Information (RAI) pertaining to Severe Accident Mitigation Alternatives (SAMA) for PNPS (TAC No. MC9676). (Accession No. ML061440026).
May 23, 2006	Letter from U.S. Fish and Wildlife Service, providing a response to the April 25, 2006 NRC staff letter requesting a list of protected species within the area under evaluation for license renewal of PNPS. (Accession No. ML061650016).
May 24, 2006	Letter from Advisory Council of Historic Preservation, Ms. Laura Henley Dean, providing a response to NRC notice of the PNPS license renewal application. (Accession No. ML061710601).
June 8, 2006	Letter from National Marine Fisheries Service, Mr. Peter Colosi, providing a response to the April 25, 2006 NRC staff letter requesting information regarding protected species and essential fish habitat within the area under evaluation for license renewal of PNPS. (Accession No. ML061710600).
July 5, 2006	Letter from Stephen J. Bethay, Entergy to NRC Document Control Desk. Subject: License Renewal Application Amendment 4: Response to Request for Additional Information Regarding Severe Accident Mitigation Alternatives for Pilgrim Nuclear Power Station (TAC No. MC9676). (Accession No. ML061930418).
July 11, 2006	Letter from CZM, Ms. Susan Snow-Cotter, CZM Federal-Consistency Review of the Pilgrim Nuclear Power Station Operating License Renewal; Plymouth. (Accession No. ML062090362).
July 13, 2006	Summary of Public Scoping Meetings Conducted Related to the Review of the PNPS, License Renewal Application (TAC No. MC9676). (Accession No. ML061700055).
July 25, 2006	Letter from NRC to Entergy Regarding Summary of Conference Calls to Discuss the Severe Accident Mitigation Alternatives Requests for Additional Information for Pilgrim (Accession No. ML062070295).

July 25, 2006	Letter from NRC to Entergy Regarding Summary of Environmental Site Audit Related to the Review of the License Renewal Application for Pilgrim. (Accession No. ML062070305).
July 25, 2006	Summary of Conferences Calls with Entergy Nuclear Operations, Inc., to Discuss the Severe Accident Mitigation Alternatives Requests for Additional Information for Pilgrim Nuclear Power Station (TAC NO. MC9676). (Accession No. ML062070295).
August 23, 2006	Summary of Follow Up Conference Call with Entergy Nuclear Operations, Inc., to Discuss the Severe Accident Mitigation Alternatives Requests for Additional Information for Pilgrim Nuclear Power Station (TAC No. MC9676). (Accession No. ML062360514).
September 26, 2006	Issuance of Environmental Scoping Summary Report Associated with the Staff's Review of the Application by Entergy Nuclear Operations, Inc., for Renewal of the Operating License for Pilgrim Nuclear Power Station. (Accession No. ML062710517).
October 24, 2006	Summary of Conference Call with Entergy Nuclear Operations, Inc, to Discuss the Severe Accident Mitigation Alternatives Requests for Additional Information for Pilgrim Nuclear Power Station. (Accession No. ML062890001).
November 28, 2006	Letter from NRC to Mr. Michael Kansler, Entergy, regarding Request for Additional Information pertaining to Severe Accident Mitigation Alternatives for PNPS (TAC No. MC9676). (Accession No. ML063280073).
December 8, 2006	Letter from NRC to Mr. Michael Kansler, Entergy, regarding Notice of Availability of the draft plant specific Supplement 29 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Pilgrim Nuclear Power Station (TAC No. 9676). (Accession No. ML063410526).
December 8, 2006	Letter from NRC to U.S. Environmental Protection Agency, Office of Federal Activities, NEPA Compliance Division, regarding Notice of Availability of the draft plant specific Supplement 29 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Pilgrim Nuclear Power Station. (Accession No. ML063410326).

December 8, 2006	Letter from NRC to Mr. Peter D. Colosi, Assistant Regional Administrator for Habitat Conservation, National Marine Fisheries Service, Biological Assessment and Essential Fish Habitat Assessment for License Renewal of Pilgrim Nuclear Power Station. (Accession No. ML063390166).
December 12, 2006	Letter from Stephen J. Bethay, Entergy to NRC Document Control Desk. Subject: License Renewal Application Amendment 10: Response to Request for Additional Information Regarding Severe Accident Mitigation Alternatives for Pilgrim Nuclear Power Station (TAC No. MC9676). (Accession No. ML070100410).
December 14, 2006	Federal Register Notice of Availability of the draft plant specific Supplement 29 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Pilgrim Nuclear Power Station (71 FR 75280). (Accession No. ML070330554).
January 5, 2007	Letter from NRC to Ms. Brona Simon, Massachusetts Historical Commission, to NRC regarding the Pilgrim Nuclear Power Station License Renewal Application Review (SHPO No. RC36661). (Accession No. ML063480099).
January 23, 2007	Letter from National Marine Fisheries Service, Mr. Peter D. Colosi, providing a response to the December 8, 2006 NRC staff letter regarding essential fish habitat within the area under evaluation for license renewal of Pilgrim Nuclear Power Station. (Accession No. ML070360071).
February 8, 2007	Letter from Ms. Brona Simon, Massachusetts Historical Commission, to NRC regarding the Pilgrim Nuclear Power Station License Renewal Application Review (SHPO No. RC36661). (Accession No. ML070510463).
March 1, 2007	Summary of Public Meetings on the Draft Supplemental Environmental Impact Statement Regarding the Pilgrim Nuclear Power Station, License Renewal Review. (Accession No. ML070590260).

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, State, regional, local, and Native American tribal agencies were contacted:

Advisory Council on Historic Preservation, Office of Federal Agency Programs, Washington DC

Barnstable County, Massachusetts

Cape Cod Commission

Duxbury Free Library

Kingston Public Library

Mashantucket Tribal Council Office, Connecticut

Massachusetts Department of Environmental Protection

Massachusetts Department of Public Health

Massachusetts Department of Telecommunications and Energy

Massachusetts Division of Coastal Zone Management

Massachusetts Division of Energy Resources

Massachusetts Division of Fisheries and Wildlife

Massachusetts Division of Marine Fisheries

Massachusetts Environmental Policy Act Office

Massachusetts Historical Comission

Mohegan Tribe, Connecticut

Narrangansett Indian Tribe, Rhode Island

National Oceanic and Atmospheric Administration, National Marine Fisheries Service - Habitat Conservation Division, Northeast Region

National Oceanic and Atmospheric Administration, National Marine Fisheries Service - Protected Resource Division, Northeast Region

Old Colony Planning Council

Plymouth County Commissioners

Plymouth County, Massachusetts

Plymouth Public Library

Town of Carver, Massachusetts

Town of Duxbury, Massachusetts

Town of Kingston, Massachusetts

Town of Marshfield, Massachusetts

Town of Plymouth, Massachusetts

U.S. Fish and Wildlife Service, New Hampshire

U.S. Environmental Protection Agency, Region I

Wampanoag Tribe of Gay Head-Aquinnah, Massachusetts

Appendix E

Pilgrim Nuclear Power Station
Compliance Status and Consultation Correspondence

Appendix E

Pilgrim Nuclear Power Station
Compliance Status and Consultation Correspondence

Correspondence received during the process of evaluation of the application for renewal of the license for Pilgrim Nuclear Power Station (PNPS) is identified in Table E-1. Copies of the correspondence are included at the end of this appendix.

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for PNPS are listed in Table E-2.

Table E-1. Consultation Correspondence

Source	Recipient	Date of Letter
National Marine Fisheries Service (M. A. Colligan)	Entergy Nuclear Generation Company (S. Bethay)	March 4, 2005
U.S. Fish and Wildlife Service (M. J. Amaral)	Entergy Nuclear Generation Company (S. Bethay)	March 9, 2005
Massachusetts Historical Commission (E. S. Johnson)	Entergy Nuclear Generation Company (S. Bethay)	March 14, 2005
Massachusetts Division of Fisheries & Wildlife (T. W. French)	Entergy Nuclear Generation Company (S. Bethay)	April 8, 2005
U.S. Fish and Wildlife Service (M. J. Amaral)	U.S. Nuclear Regulatory Commission (R. Franovich)	May 23, 2006
Advisory Council on Historic Preservation (L. H. Dean)	U.S. Nuclear Regulatory Commission (R. Franovich)	May 24, 2006
National Marine Fisheries Service (P. D. Colosi)	U.S. Nuclear Regulatory Commission (R. Franovich)	June 8, 2006
Massachusetts Office of Coastal Zone Management (S. Snow-Cotter)	Entergy Nuclear Generation Company (S. Bethay)	July 11, 2006
U.S. Nuclear Regulatory Commission (R. Franovich)	Entergy Nuclear Operations, Inc. (Michael R. Kansler)	December 8, 2006
U.S. Nuclear Regulatory Commission (R. Franovich)	U.S. Environmental Protection Agency	December 8, 2006
U.S. Nuclear Regulatory Commission (Pao-Tsin Kuo)	National Marine Fisheries Service (P. D. Colosi)	December 8, 2006

Table E-1. (contd)

Source	Recipient	Date of Letter
National Marine Fisheries Service (P. D. Colosi)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	January 23, 2007
Massachusetts Historical Commission (B. Simon)	U.S. Nuclear Regulatory Commission (R. Franovich)	February 8, 2007
Massachusetts Historical Commission (B. Simon)	Entergy Nuclear Generation Company (S> Bethay)	May 30, 2007

Table E-2. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Pilgrim Nuclear Power Station

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	10 CFR Part 50	Operating license	DPR-35	09/15/72	06/08/12	Authorizes operation
NRC	10 CFR Part 40 and 70	Material license	20-07626-04	02/10/03	02/28/13	Contamination on reactor components
DOT	49 CFR 107, Subpart G	Registration	053006 550 005O	05/30/06	06/30/07	Radioactive and hazardous materials shipment
EPA	Clean Water Act (33 USC 1251)	NPDES Permit	Federal: MA0003557 Massachusetts: 359	04/29/91	04/29/96	Plant discharges into Cape Cod Bay. Permit remains in effect pending EPA and Commonwealth action on renewal applications.
FWS	Migratory Bird Treaty Act (16 USC 703-712)	Depredation Permit	MB831184-0	07/01/06	06/30/07	Removal of birds, eggs and nests from utility structures and property
FWS and NMFS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation				Requires a Federal agency to consult with FWS and NMFS regarding whether a proposed action would affect endangered or threatened species
Massachusetts Department of Environmental Protection	Clean Water Act Section 401 (16 USC 470f)	Certification				Requires a Commonwealth certification that discharge would comply with Clean Water Act standards
Massachusetts Historical Commission	National Historic Preservation Act Section 106	Consultation				Requires a Federal agency to consider cultural impacts and consult with the State Historic Preservation Officer

Table E-2. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
Massachusetts Office of Costal Zone Management	Federal Costal Zone Management Act (16 USC 1451)	Certification	Not Applicable	7/11/06		Requires an applicant to provide certification to the Federal agency that license renewal would be consistent with the Federally-approved state costal zone management plan.
Massachusetts Department of Public Health	M.G.L. Chapter 111, Section 5N	Material License	07-6262	04/22/03	04/30/08	Containment on reactor components
Massachusetts Department of Public Health	M.G.L. Chapter 111, Section 5N	Material License	49-0078	05/11/06	05/31/11	Containment on reactor components
Massachusetts Department of Public Safety	M.G.L. Chapter 148, Section 13	Registration	Not Applicable			Storing flammable materials in tanks
Massachusetts Department of Environmental Protection	310 CMR 7.02 (11) 310 CMR 7.02 (11)(e)	50% Facility Emission Cap		07/18/05		Emissions from various combustion sources
Massachusetts Department of Environmental Protection	M.G.L. Chapter 21, Sections 26-53	Groundwater Discharge Permit	#2-389	04/20/99	04/20/04	Treated effluent discharges to groundwater from wastewater treatment facility. Permit administratively continued pending review of application
Massachusetts Department of Environmental Protection	M.G.L. Chapter 21C 310 CMR 30	Large Quantity Generator	MAR000014167	10/06/99		Hazardous waste generation

Table E-2. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
South Carolina Department of Health and Environmental Control	South Carolina Radioactive Waste Transportation and Disposal Act (SC ST SEC 13-7-110)	Radioactive Waste Transport Permit	0007-20-07-X	12/12/06	12/31/07	Transportation of radioactive waste to disposal facility in South Carolina
Tennessee Department of Environment and Conservation	TCA 68-202-206	Radioactive Waste License-for-Delivery	T-MA004-L07	12/05/06	12/31/07	Shipment of radioactive waste to disposal/processing facility in Tennessee

CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
FWS = U.S. Fish and Wildlife Service
M.G.L. = Massachusetts General Laws
NMFS = National Marine Fisheries Service
NRC = U.S. Nuclear Regulatory Commission
SC ST = South Carolina Statutes
TCA = Tennessee Code Annotated
USC = United States Code

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

MAR -4 2005

Stephen Bethay
Director, Nuclear Assessment
Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

Re: Pilgrim Nuclear Power Station, Protected Species

Dear Mr. Bethay,

This is in response to your letter dated February 3, 2005, requesting information on the presence of any federally threatened or endangered species under the jurisdiction of the National Marine Fisheries Service (NMFS) in the vicinity of the Pilgrim Nuclear Power Station (PNPS), located on the western shore of Cape Cod Bay in Plymouth County, MA. Entergy Nuclear Power Station is currently preparing an application to the U.S. Nuclear Regulatory Commission (NRC) for the renewal of the operating license for PNPS, as the current operating license expires in June 2012, the information requested is to assist with the application process.

As mentioned in your letter, four species of federally threatened or endangered sea turtles and three species of endangered whales may be found in the waters of Cape Cod. The sea turtles in northeastern nearshore waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Loggerhead turtles have been found to be relatively abundant off the Northeast coast (from near Nova Scotia, Canada to Cape Hatteras, North Carolina). Loggerheads and Kemp's ridleys have been documented in waters as cold as 11°C, but generally migrate northward when water temperatures exceed 16°C. These species are typically present in Massachusetts waters from June – October. Federally endangered leatherback sea turtles (*Dermochelys coriacea*) are located in Massachusetts waters during the warmer months as well. While leatherbacks are predominantly pelagic, they may occur close to shore, especially when pursuing their preferred jellyfish prey. Green sea turtles *(Chelonia mydas)* may also occur sporadically in Massachusetts waters, but those instances would be rare.

Federally endangered North Atlantic right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*) may all also be found seasonally in Massachusetts waters. North Atlantic right whales have been documented in the nearshore waters of Massachusetts from December through June. Humpback whales feed during the spring, summer, and fall over a range that encompasses the eastern coast of the United States. Fin whales are common in waters of the United States Exclusive Economic Zone, principally offshore from Cape

Hatteras northward. While these whale species are not considered residents of the Cape Cod Bay area, it is possible that transients may enter the area during seasonal migrations.

It is the understanding of NMFS that there have been no interactions or impingements of sea turtles at PNPS in the past 30 years of monitoring at PNPS. However, since the entrainment and impingement of sea turtles at several nuclear power plants on the East Coast has been documented, and as sea turtles may be seasonally present in the vicinity of the intakes associated with the PNPS, NMFS recommends that this impact be fully addressed in the application being prepared.

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, states that each Federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Any discretionary federal action that may affect a listed species must undergo Section 7 consultation. As listed species may be present in the project area, the federal action agency, in this case the NRC, is responsible for determining whether the proposed action is likely to affect any listed species. The NRC should then submit their determination along with a request for concurrence, to the attention of the Endangered Species Coordinator, NOAA Fisheries, Northeast Regional Office, Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930. After reviewing this information, NOAA Fisheries would then be able to conduct a consultation under section 7 of the ESA.

Should you have any questions about these comments or about the section 7 consultation process in general, please contact Sara McNulty at (978) 281-9328 ext. 6520.

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

Cc: Boelke, F/NER4

File Code. Sec 7, Pilgrim Nuclear Power Station, Spp. Pres.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

March 9, 2005

Stephen Bethay
Entergy Nuclear Generation Company
600 Rocky Hill Road
Plymouth, MA 02360

Dear Mr. Bethay:

We are in receipt of your February 3, 2005 letter regarding the license renewal process for the Pilgrim Nuclear Power Station (PNPS), Plymouth, Massachusetts. The following comments are provided in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543).

The federally-threatened piping plover (*Charadrius melodus*) and federally-endangered roseate tern (*Sterna dougallii*) are known to occur along Plymouth Beach, just north of the PNPS. Occasional wintering bald eagles (*Haliaeetus leucocephalus*) are also sometimes present in the area. According to our records, none of the above-listed species are known to frequent the immediate vicinity of PNPS and, therefore, the presence of these species near the power station is probably transient in nature.

As stated in your letter, the PNPS-to-Snake Hill Road transmission corridor crosses critical habitat for the endangered red-bellied cooter (*Pseudemys rubriventris*). We concur with your determination that the area crossed by the transmission line does not provide the specific biological habitat needs for the red-bellied cooter. However, turtles may traverse the transmission line corridor and the area is considered critical based on its value to buffer against activities that may degrade water quantity and quality in ponds occupied by the species

Information was provided regarding several marine mammals and turtles. Jurisdiction for those species resides with the National Marine Fisheries Service. We suggest you contact them at their Gloucester, Massachusetts office at 978-281-9300 with regard to the relicensing of the PNPS.

- 2 -

Since no expansion of existing facilities is planned and no additional land disturbance is anticipated, we concur with your determination that license renewal for PNPS is not likely to adversely affect federally-listed species subject to the jurisdiction of the U.S Fish and Wildlife Service, and that formal consultation with us is not required.

Thank you for your coordination. Please contact us at 603-223-2541 if we can be of further assistance.

Sincerely yours,

Michael J. Amaral

Michael J. Amaral
Endangered Species Specialist
New England Field Office

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

March 14, 2005

Stephen Bethay
Director, Nuclear Assessment
Pilgrim Nuclear Power Station
Entergy Nuclear Generation Company

RE: Pilgrim Nuclear Power Station License Renewal, Plymouth, MHC #RC.36661

Dear Mr. Bethay:

Thank you for submitting information to the Massachusetts Historical Commission regarding the proposed project referenced above. Staff of the MHC have reviewed the information you submitted and have the following comments.

MHC understands from your letter that Entergy has no plans to alter current operations at the power station, to expand existing facilities, or to undertake ground-disturbing activities over the license renewal period.

In addition to the five archaeological sites mentioned in your letter, review of MHC's Inventory of the Historic and Archaeological Assets of the Commonwealth indicates that there is one additional recorded archaeological site within the project area, which consists of the existing power station and transmission line corridor. This site (MHC site #19-68), located within the transmission line corridor north of Rocky Hill Road, is associated with the Native American settlement of the Plymouth area. After review of MHC's files and the information you submitted, MHC staff have determined that the proposed license renewal as currently described is unlikely to affect significant historic or archaeological resources.

Should plans change and if activities involving ground disturbance are contemplated, MHC requests the opportunity to review project plans in order to assess potential effects to historic and archaeological resources and to determine whether an archaeological survey is warranted for project impact areas.

These comments are offered in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and Massachusetts General Laws, Chapter 9, Sections 26-27C (950 CMR 71). If you have any questions concerning this review, please feel free to contact me at this office.

Sincerely,

Eric S. Johnson
Archaeologist/Preservation Planner
Massachusetts Historical Commission

xc: Plymouth Historical Commission
Cheryl Andrews-Maltais, THPO, WTGHA

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.state.ma.us/sec/mhc

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

April 8, 2005

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
Attn: Stephen Bethay
600 Rocky Hill Road
Plymouth, MA 02360

RE: Pilgrim Nuclear Power Plant
Plymouth, MA
Renewal of Operating License
NHESP File No 04-16063

Dear Mr. Bethay,

Thank you for contacting the Natural Heritage and Endangered Species Program (NHESP) of the MA Division of Fisheries and Wildlife for information regarding state-listed rare species at the above referenced site.

As you are aware from our previous letters, there are state-protected rare species that occur within proximity to the above site. According to the 11th edition of the Massachusetts Natural Heritage Atlas, a majority of *Priority Habitat 1320* (PH 1320) and *Estimated Habitat 148* (WH 148) falls within a half mile radius to the subject project location. The Spotted Turtle (*Clemmys guttata*), a state-listed species of Special Concern is located in this Estimated Habitat polygon.

This species is protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.37 and 10.59). Fact sheets for this species can be found on our website http://www.nhesp.org

With regard to determining the potential impacts this project would have on this and other state-listed species, it is not something that can be assessed without more specific information regarding the details associated with the operation of the power plant. If there are no plans to expand the footprint or to alter current operations over the license period, then it would not seem likely that there would be an adverse affect on state-protected wildlife species. However, the NHESP can not at this time officially make this determination unless we were to receive more detailed information in order to conduct a full environmental review. If you have any further questions, please contact Jenna Garvey, Environmental Review Assistant at: (508) 792-7270, extension 303.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Plymouth Conservation Commission

www.masswildlife.org

Division of Fisheries and Wildlife
Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 792-7270 Fax (508) 792-7275
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

May 23, 2006

Rani Franovich
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Ms. Franovich:

We are in receipt of your April 25, 2006 letter regarding the license renewal process for the Pilgrim Nuclear Power Station, Plymouth, Massachusetts. This office received and responded to a letter dated February 3, 2005 that requested an informal consultation with regard to federally-threatened and endangered species from the applicant, Entergy Nuclear Generation Company. Enclosed is a copy of our response, dated March 9, 2005. In addition, we have no comments with regard to the Fish and Wildlife Coordination Act.

Thank you for your coordination. Please contact Anthony Tur at 603-223-2541 if we can be of further assistance.

Sincerely yours,

Michael J. Amaral

Michael J. Amaral
Endangered Species Specialist
New England Field Office

Enclosure

Preserving America's Heritage

May 24, 2006

Rani Franovich
Division of License Renewal
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: License Renewal Application - Pilgrim Nuclear Power Station
Town of Plymouth, Massachusetts

Dear Ms. Franovich:

On May 8, 2006, we received your notice that, in accordance with 10 CFR Part 54, an application for renewal of the Pilgrim Nuclear Power Station operating license has been filed with the Nuclear Regulatory Commission (NRC). In this notice, you refer to 36 CFR §800.8 of the regulation (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act. This section of the ACHP's regulation contains two parts that serve two different purposes. The first part, 36 CFR §800.8(a), establishes general principles for improving the coordination between the ACHP's regulation and the requirements of the National Environmental Policy Act (NEPA). The second part of this section, 36 CFR §800.8(c), establishes the standards that must be met when a Federal agency decides to use the documentation and requirements of NEPA to comply with Section 106.

It is unclear whether your reference to 36 CFR §800.8 means that NRC intends to adhere to the general principles for better coordination between Section 106 and NEPA, or to substitute the requirements of NEPA for §§ 800.3 through 800.6 of the ACHP's regulation. In accordance with 36 CFR §800.8(c), if NRC intends to use the substitution provision, then you must notify not only the ACHP, but also the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) that you intend to do so. We note that the SHPO/THPO does not appear to have been included among the recipients of this notice.

We request that NRC clarify this matter and provide us with a copy of any notice that you may send to the SHPO/THPO pursuant to 36 CFR §800.8(c). It is particularly important that you do so because of the advisory role of the ACHP under in resolving consulting parties' objections submitted pursuant to 36 CFR §800.8(c)(2) and (3).

ADVISORY COUNCIL ON HISTORIC PRESERVATION
1100 Pennsylvania Avenue NW, Suite 809 • Washington, DC 20004
Phone 202-606-8503 • Fax 202-606-8647 • achp@achp.gov • www.achp.gov

Should you have any questions, please contact us at 202-606-8503.

Sincerely,

Laura Dean

Laura Henley Dean, PhD
Program Analyst
Office of Federal Agency Programs

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JUN - 8 2006

Ms. Rani Franovich
Branch Chief, Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulator Commission
Washington, DC 20555-0001

Dear Ms. Franovich:

This letter is in response to your request for information regarding Essential Fish Habitat (EFH) and protected species within the area under evaluation for the Pilgrim Nuclear Power Station License Renewal Application. Pilgrim Nuclear Power Station is located within Plymouth Bay and Cape Cod Bay, in Plymouth, MA. The proposed action is to renew the existing license for an additional 20 years beyond the expiration of the current operating license. The National Marine Fisheries Service (NMFS) is providing the following comments to identify and address potential adverse impacts on EFH, protected species, as well as other public trust resources.

The EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) require federal agencies to consult with NMFS on projects such as this that may adversely affect EFH. Insofar as a project involves EFH, as this project does, this process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments and generally outlines each agency's obligations in this consultation procedure.

Essential Fish Habitat
Plymouth Bay and Cape Cod Bay have been designated as EFH for a number of federally managed species including, but not limited to, winter flounder, Atlantic cod, windowpane flounder, red hake, and white hake. A complete list of species and life stages that have been designated for the proposed project location can be found on the NMFS Habitat Conservation Division website at http://www.nero.noaa.gov/ro/doc/webintro.html

EFH Assessment
The required contents of an EFH assessment include: a description of the action; an analysis of the potential adverse effects of the action on EFH and the managed species; the action agency's conclusions regarding the effects of the action on EFH; and proposed mitigation, if applicable. Other information that should be contained in the EFH assessment, if appropriate, includes: the results of on-site inspections to evaluate the habitat and site-specific effects; the views of recognized experts on the habitat or the species that may be affected; a review of pertinent literature and related information; and

an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH. The EFH assessment should be contained in the Draft Environmental Impact Statement (DEIS) and clearly labeled as such within the document. NMFS will commence the EFH consultation upon receipt of the completed assessment.

Fishery Resources under the Fish and Wildlife Coordination Act
In addition to the EFH provisions of the MSA, the Fish and Wildlife Coordination Act (FWCA) requires federal agencies to consult with federal and state natural resource agencies regarding activities or licensing that impact fish and wildlife resources. In that regard, several finfish and shellfish resources, considered to be NMFS trust resources, are expected to be present in the vicinity of the proposed project. These include, but are not limited to, American lobster, alewife, blueback herring, rainbow smelt, and Atlantic menhaden. It is important to note that all fishery resources within the project area are NMFS trust resources. Accordingly, NMFS will seek to avoid and minimize adverse effects to these resources, pursuant to the FWCA.

Impingement and Entrainment
As currently operated, the Pilgrim Nuclear Power Station adversely affects a variety of fish and shellfish resources through impingement on cooling water intake screens and through entrainment into the plant's cooling system. Pilgrim Station has been monitoring entrainment of eggs and larvae for over 25 years, and such site-specific information should be utilized in the evaluation of impacts from the proposed action. Based on this analysis, alternatives which avoid and minimize adverse effect to fishery resources should be considered and analyzed in the DEIS.

As described within the 2001 draft EFH assessment, the NRC utilizes the "adult equivalent" analysis in order to determine relative impact of the facility on fishery resources. However, this method focuses solely on finfish survival to maturity and does not account for ecosystem and food web benefits resulting from egg and larval predation. In order to fully account for adverse impacts resulting from the facility, the proposed assessment should include an analysis of ecosystem and food web benefits foregone as a result of operational impacts on eggs and larvae.

Thermal discharges
The Pilgrim Nuclear Power Station is currently authorized to discharge heated effluent into Plymouth Bay. As stated within the 2001 draft EFH assessment, discharge temperature differentials ranging from 33.8 - 48 degrees Fahrenheit have been found to occur in an area of up to 1.17 acres. Adverse impacts on fishery resources and EFH resulting from the thermal plume within this "mixing zone" should be detailed within the EFH assessment.

Compensatory Mitigation
Currently, Pilgrim Station attempts to offset adverse impacts on living marine resources through a winter flounder hatchery/stocking program. Pilgrim Station, through Llennoco, Inc., currently stocks approximately 25,000 winter flounder young-of-year (YOY) juveniles/larvae per year into Plymouth Bay. The NRC should analyze the success of the

current mitigation program within the proposed environmental review, as well as potential modifications to the program, as compared to the loss of ecosystem and food web benefits forgone as a result of operational impacts on eggs and larvae of all species.

Protected Resources

Several listed species of whales and sea turtles are known to occur seasonally in the waters off of Massachusetts. Federally endangered Northern right whales (*Eubalaena glacialis*) have been documented in the nearshore waters of Massachusetts from December through June and are likely to be present in Cape Cod Bay from December 15 – April 15 and Great South Channel from March 1 – June 30. Endangered humpback whales (*Megaptera novaeangliae*) feed during the spring, summer, and fall over a range that encompasses the eastern coast of the United States. Humpback whales are found off the coast of Massachusetts from March 15 – November 30. Fin (*Balaenoptera physalus*), sei (*Balaenoptera borealis*), and sperm (*Physter macrocephalus*) whales are also seasonally present in New England waters but are typically found in deeper offshore waters.

Certain New England waters have also been designated as critical habitat for the Northern right whale (final rule at 59 FR 28793). The Great South Channel critical habitat is the area bounded by 41°40' N/69°45' W; 41°00' N/69°05' W; 41°38' W; and 42°10' N/68°31' W. The Cape Cod Bay critical habitat is the area bounded by 42°02.8' N/70°10' W; 42°12' N/70°15' W; 42°12' N/70°30' W; 41°46.8' N/70°30' W, and on the south and east by the interior shore line of Cape Cod, Massachusetts.

The occurrence of sea turtles in northeastern nearshore waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*), followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Loggerhead turtles have been found to be relatively abundant off the Northeast coast (from near Nova Scotia, Canada to Cape Hatteras, North Carolina). Loggerheads and Kemp's ridleys have been documented in waters as cold as 11 degrees Centigrade (C), but generally migrate north towards New England when water temperatures exceed 16 degrees C. These species are typically present in New England waters from June 1 – November 30. Federally endangered leatherback sea turtles (*Dermochelys coriacea*) are located in New England waters during the warmer months as well. While leatherbacks are predominantly pelagic, they may occur close to shore, especially when pursuing their preferred jellyfish prey. Green sea turtles (*Chelonia mydas*) may also occur sporadically in New England waters, but those instances would be rare.

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, states that each federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. Any discretionary federal action that may affect a listed species must undergo Section 7 consultation. The NRC is responsible for determining if the proposed project is likely to affect listed species, and for obtaining the concurrence of NMFS with their determination. If the NRC determines that the project is "not likely to adversely affect"

any listed species (i.e., when direct or indirect effects of the proposed project or its interdependent and/or interrelated actions on listed species are expected to be discountable, insignificant, or completely beneficial) and NMFS concurs with this determination, NMFS will reply to NRC in a letter that will convey the concurrence, thus completing Section 7 consultation. If the ACOE determines that the project is "likely to adversely affect" any listed species (i.e., if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effects are not: discountable, insignificant, or beneficial) or NMFS does not concur with the NRC's "not likely to adversely affect" determination, formal Section 7 consultation, resulting in the issuance of a Biological Opinion, may be required. Any effects that amount to the take of a listed species (defined by the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct") are not discountable, insignificant, or entirely beneficial. Therefore, if any take is anticipated, formal consultation is required.

Thank you for your coordination with NMFS regarding this issue. If you have further questions regarding this project, please contact Christopher Boelke at 978-281-9131. For more information on the Section 7 process or listed species that are likely to be present in Cape Cod Bay, please contact Julie Crocker in NMFS Protected Resources Division at (978)281-9300 x6530.

Sincerely,

Louis A. Chiarella
for Peter D. Colosi
Assistant Regional Administrator
for Habitat Conservation

cc: Alicia Williamson, Project Manager (NRC)
David Webster, John Nagle (USEPA)
Michael Bartlett (USFWS)
Paul Diodati, Jack Schwartz (MADMF)
Susan Snow-Cotter, Todd Callaghan (MACZM)
Mary Colligan, Julie Crocker (PRD)

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
251 Causeway Street, Suite 800, Boston, MA 02114-2136
(617) 626-1200 FAX: (617) 626-1240

July 11, 2006

Stephen Bethay
Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

RE: CZM Federal Consistency Review of the Pilgrim Nuclear Power Station Operating License Renewal; Plymouth

Dear Mr. Bethay:

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the operating license renewal for the Pilgrim Nuclear Power Station, in Plymouth.

We concur with your certification and find that the activity as proposed is consistent with the CZM enforceable program policies.

If the above-referenced proposal, which has received this concurrence from CZM, is modified in any manner or is noted to be having effects on the coastal zone or its uses that are substantially different than originally proposed, please submit an explanation of the nature of the change to this Office pursuant to 301 CMR 21.17 and 15 CFR 930.66.

Thank you for your cooperation with CZM.

Sincerely,

Susan Snow-Cotter
Director

SSC/JB

Cc: Rani Franovich, Branch Chief
Branch B, Divison of License Renewal
U.S. Nuclear Regulatory Commission, Washington D.C. 20555-0001
Jason Burtner, CZM South Shore Regional Coordinator

MITT ROMNEY GOVERNOR, KERRY HEALEY LIEUTENANT GOVERNOR, STEPHEN R. PRITCHARD SECRETARY, SUSAN SNOW-COTTER DIRECTOR
www.mass.gov/czm

December 8, 2006

Mr. Michael R. Kansler
President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT PLANT-SPECIFIC SUPPLEMENT 29 TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS REGARDING PILGRIM NUCLEAR POWER STATION (TAC NOS. MC9676)

Dear Mr. Kansler:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed the draft plant-specific Supplement 29 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)," regarding the renewal of operating license DPR-35 for an additional 20 years of operation for Pilgrim Nuclear Power Station. Enclosed is a copy of the draft supplement and the associated *Federal Register* Notice of Availability. This notice advises the public that the draft supplement is publicly available at the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC website at http://adamswebsearch.nrc.gov/dologin.html. The Accession Number for the draft Supplement 29 to the GEIS is ML063260173. In addition, the Plymouth Public Library, 132 South Street, the Duxbury Free Library, 77 Alden Street, and the Kingston Public Library, 6 Green Street, have agreed to make the draft supplement available for public inspection.

As discussed in Section 9.3 of the draft supplement, the preliminary recommendation of the staff is that the Commission determine that the adverse environmental impacts of license renewal for the Pilgrim Nuclear Power Station are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable. This recommendation is based on: (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Entergy Nuclear Operations, Inc.; (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments received during the scoping process.

M. Kansler - 2 -

A separate Notice of Availability of the draft Supplemental Environmental Impact Statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter, please contact the NRC Environmental Project Manager, Ms. Alicia Williamson, at 301-415-1878 or by e-mail at arw1@nrc.gov.

Sincerely,

/RA/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure:
As stated

cc w/encl: See next page

M. Kansler - 2 -

A separate Notice of Availability of the draft Supplemental Environmental Impact Statement will be placed in the *Federal Register* through the U.S. Environmental Protection Agency. If you have any questions regarding this matter, please contact the NRC Environmental Project Manager, Ms. Alicia Williamson, at 301-415-1878 or by e-mail at arw1@nrc.gov.

Sincerely,

/RA/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-293

Enclosure:
As stated

cc w/encl: See next page

DISTRIBUTION: See next page

ADAMS Accession Nos:
1. Letter w/Svc List, FRN: **ML063410493**
2. "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 29": **ML063260173**
3. Pkg: **ML063410526**

C:\FileNet\ML063410493.wpd

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NAME	IKing	Williamson	SUttal	R. Franovich
DATE	11/24/06	11/27/06	11/21/06	12/8/06

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7590-01-P

UNITED STATES NUCLEAR REGULATORY COMMISSION

ENTERGY NUCLEAR OPERATIONS, INC.,

PILGRIM NUCLEAR POWER STATION

NOTICE OF AVAILABILITY OF THE DRAFT SUPPLEMENT 29 TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS, AND PUBLIC MEETING FOR THE LICENSE RENEWAL OF PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

Notice is hereby given that the U.S. Nuclear Regulatory Commission (NRC, Commission) has published a draft plant-specific supplement to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), NUREG-1437, regarding the renewal of operating license DPR-35 for an additional 20 years of operation for the Pilgrim Nuclear Power Station (Pilgrim). Pilgrim is located on the western shore of Cape Cod in the Town of Plymouth, Plymouth County, Massachusetts. It is 38 miles southeast of Boston, Massachusetts, and 44 miles east of Providence, Rhode Island. Possible alternatives to the proposed action (license renewal) include no action and reasonable alternative energy sources.

The draft Supplement 29 to the GEIS is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland, 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.htm. The Accession Number for the draft Supplement 29 to the GEIS is ML063260173. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's

PDR reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr@nrc.gov. In addition, the Plymouth Public Library, 132 South Street; Duxbury Free Library, 77 Alden Street; and the Kingston Public Library, 6 Green Street, has agreed to make the draft supplement to the GEIS available for public inspection.

Any interested party may submit comments on the draft supplement to the GEIS for consideration by the NRC staff. To be certain of consideration, comments on the draft supplement to the GEIS and the proposed action must be received by February 28, 2007. Comments received after the due date will be considered if it is practical to do so, but the NRC staff is able to assure consideration only for comments received on or before this date. Written comments on the draft supplement to the GEIS should be sent to: Chief, Rules and Directives Branch, Division of Administrative Services, Office of Administration, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC, 20555-0001.

Comments may be hand-delivered to the NRC at 11545 Rockville Pike, Room T-6D59, Rockville, Maryland, between 7:30 a.m. and 4:15 p.m. on Federal workdays. Electronic comments may be submitted to the NRC by e-mail at PilgrimEIS@nrc.gov. All comments received by the Commission, including those made by Federal, State, local agencies, Native American Tribes, or other interested persons, will be made available electronically at the Commission's PDR in Rockville, Maryland, and through ADAMS.

The NRC staff will hold a public meeting to present an overview of the draft plant-specific supplement to the GEIS and to accept public comments on the document. The public meeting will be held on January 24, 2007, at the Radisson Plymouth Harbor Ballroom, 180 Water Street, Plymouth, Massachusetts 02360. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m. with a repeat of the overview portions of the meeting and will continue until 10:00 p.m., as necessary. Both

-3-

meetings will be transcribed and will include: (1) a presentation of the contents of the draft plant-specific supplement to the GEIS, and (2) the opportunity for interested government agencies, organizations, and individuals to provide comments on the draft report. Additionally, the NRC staff will host informal discussions one hour prior to the start of each session at the same location. No comments on the draft supplement to the GEIS will be accepted during the informal discussions. To be considered, comments must be provided either at the transcribed public meeting or in writing. Persons may pre-register to attend or present oral comments at the meeting by contacting Ms. Alicia Williamson, the NRC Environmental Project Manager at 1-800-368-5642, extension 1878, or by e-mail at PilgrimEIS@nrc.gov, no later than January 17, 2007. Members of the public may also register to provide oral comments within 15 minutes of the start of each session. Individual, oral comments may be limited by the time available, depending on the number of persons who register. If special equipment or accommodations are needed to attend or present information at the public meeting, the need should be brought to Ms. Alicia Williamson attention no later than January 10, 2007, to provide the NRC staff adequate notice to determine whether the request can be accommodated.

FOR FURTHER INFORMATION, CONTACT: Ms. Alicia Williamson, Environmental Branch B, Division of License Renewal, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Mail Stop O-11F1, Washington, DC, 20555-0001. Ms. Alicia Williamson may be contacted at the aforementioned telephone number or e-mail address.

Dated at Rockville, Maryland, this 8th day of December, 2007.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert Schaaf, Acting Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Letter to M. Kansler, from R. Franovich, dated December 8, 2006

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT PLANT-SPECIFIC SUPPLEMENT 29 TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS REGARDING PILGRIM NUCLEAR POWER STATION (TAC NOS. MC9676)

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Pilgrim Nuclear Power Station

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December 8, 2006

U.S. Environmental Protection Agency
Office of Federal Activities
NEPA Compliance Division
EIS Filing Section
Ariel Rios Building (South Oval Lobby)
Mail Code 2252-A, Room 7241
1200 Pennsylvania Avenue, NW
Washington, DC 20460

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT PLANT-SPECIFIC SUPPLEMENT 29 TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS REGARDING PILGRIM NUCLEAR POWER STATION

Dear Sir or Madam:

The following documents are enclosed for official filing with the U.S. Environmental Protection Agency:

1. Five copies of the draft Supplement 29 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)," regarding the license renewal of Pilgrim Nuclear Power Station.

2. Five copies of the U.S. Nuclear Regulatory Commission's (NRC's) distribution list for the draft Supplement 29 to NUREG-1437.

Simultaneously with this filing, a copy of the draft Supplement 29 is being mailed to interested Federal and State agencies, industry organizations, interest groups, and members of the public. A copy of this document has also been placed in the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is located on the NRC's Web site at http://adamswebsearch.nrc.gov/dologin.html. The Accession Number for the draft Supplement 29 to the GEIS is ML063260173. Please note that the public comment period for the draft Supplement 29 to the GEIS ends on February 28, 2007.

-2-

If further information is required, please contact the NRC Environmental Project Manager, Ms. Alicia Williamson at 301-415-1878 or by e-mail at arw1@nrc.gov.

Sincerely,

/RA/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosures:
As stated

cc w/encls: See next page

-2-

If further information is required, please contact the NRC Environmental Project Manager, Ms. Alicia Williamson at 301-415-1878 or by e-mail at arw1@nrc.gov.

Sincerely,

/RA/

Rani L. Franovich, Branch Chief
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Docket No. 50-293

Enclosures:
As stated

cc w/encls: See next page

DISTRIBUTION: See next page

ADAMS Accession nos.:
1. Letter to EPA: **ML063410331**
2. Draft Supplement 29 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants,": **ML063260173**
3. Package: **ML063410326**

OFFICE	DLR:LA	DLR:REBB:PM	OGC	DLR:REBB:BC
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DATE	12/06/06	12/05/06	12/08/06	12 /08/06

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Memo to U.S. Environmental Protection Agency from R. Franovich dated December 8, 2006

SUBJECT: NOTICE OF AVAILABILITY OF THE DRAFT PLANT-SPECIFIC SUPPLEMENT 29 TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS REGARDING PILGRIM NUCLEAR POWER STATION

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Pilgrim Nuclear Power Station

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December 8, 2006

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SUBJECT: BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT FOR LICENSE RENEWAL OF PILGRIM NUCLEAR POWER STATION (TAC NO. MC9676)

Dear Mr. Colosi:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed the enclosed draft Supplement 29 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), to evaluate the proposed renewal of the Pilgrim Nuclear Power Station (Pilgrim) operating license for a period of an additional 20 years. In accordance with the Endangered Species Act of 1973, as amended, the NRC's Biological Assessment (BA) for license renewal of Pilgrim is included in Appendix E of the enclosed draft Supplemental Environmental Impact Statement (SEIS). Also, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, the NRC is requesting initiation of an Essential Fish Habitat (EFH) consultation regarding this proposed action of license renewal. The NRC's EFH Assessment for license renewal of Pilgrim is also in Appendix E of the enclosed draft SEIS.

Pilgrim is located on the western shore of Cape Cod Bay in the Town of Plymouth, Plymouth County, Massachusetts. Pilgrim is equipped with a once-through heat dissipation system that withdraws cooling water from and discharges it to Cape Cod Bay. Seawater for cooling and service water is withdrawn from Cape Cod Bay via an embayment formed by two breakwaters. After circulating through the condensers, cooling water is returned to Cape Cod Bay via a discharge channel immediately adjacent to the intake embayment.

The NRC staff identified a total of 10 aquatic Federally listed endangered, threatened, or candidate species of concern having the potential to be present in the vicinity of Pilgrim and its associated transmission line right-of-way. The evaluation in the BA concludes that the proposed action would have no effect on any of the 10 Federally listed species.

As described in the EFH Assessment, the NRC staff identified 32 species that have EFH designated in the vicinity of Pilgrim. The evaluation in the EFH Assessment concludes a minimal adverse effect on EFH for 17 species, a less than substantial adverse effect on EFH for 8 species, and a substantial adverse effect on EFH for 7 species. The NRC staff has determined that continued operation of the Pilgrim cooling system, with its existing mitigation measures, is expected to have an overall minimal adverse effect on EFH within the Cape Cod Bay ecosystem.

P. Colosi -2-

We are requesting your concurrence with our determination in the BA and conclusion of the Section 7 consultation. We are also requesting initiation of an EFH consultation. In reaching our conclusion, the NRC staff relied on information provided by the applicant, on research performed by NRC staff, information from the Fish and Wildlife Service, and on information from National Marine Fisheries Service. If you have any questions regarding the enclosed draft SEIS, the BA or EFH Assessment in Appendix E of the SEIS, or the staff's request, please contact Ms. Alicia Williamson, Environmental Project Manager, at 301-415-1878 or by e-mail at arw1@nrc.gov.

Sincerely,

/RA/

Pao-Tsin Kuo, Acting Director
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure:
As stated

cc w/encl: See next page

P. Colosi -2-

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Sincerely,

/RA/

Pao-Tsin Kuo, Acting Director
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Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure:
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Adams Accession Nos.:
1. Ltr. To P. Kurkul w/Svc. List: **ML063390166**
2. Draft Supplemental 29 to NUREG-1437 "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS): **ML063260173**
3. Pkg.: **ML063390154**

OFFICE	LA:DLR	ES:DLR:REBB	PM:DLR:REBB	BC:DLR:REBB	(A)D:DLR
NAME	S. Figueroa	Hnash (w/changes)	AWilliamson	Rschaaf for RFranovich	PTKuo
DATE	12/07/06	12/07/06	12/07/06	12/08/06	12/08/06

OFFICIAL RECORD COPY

Pilgrim Nuclear Power Station

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JAN 23 2007

Dr. Pao-Tsin Kuo, Acting Director
Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulator Commission
Washington, DC 20555-0001

Dear Dr. Kuo:

The National Marine Fisheries Service (NMFS) has reviewed the Generic Environmental Impact Statement (GEIS) Supplement 29 and Essential Fish Habitat (EFH) assessment regarding the proposed renewal of the operating license for the Pilgrim Nuclear Power Station in Plymouth, MA. The proposed action by the US Nuclear Regulatory Commission (NRC) is to renew the operating license for the facility, with no physical alterations or construction proposed. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Fish and Wildlife Coordination Act (FWCA) require federal agencies to consult with one another on projects such as this. As stated in your December 8, 2006 letter, the NRC is requesting initiation of EFH consultation with NMFS.

Based on our review of the GEIS, NMFS concurs with the NRC's determination that adverse impacts on living marine resources and habitats will occur as a result of the operation of the facility. Specific issues of concern include the impingement and entrainment of fishery resources resulting from the intake of water for cooling purposes as well as the discharge of heated effluent into Cape Cod Bay. The GEIS states that operational impacts will result in adverse effects to winter flounder (*Pseudopleuronectes americanus*) and rainbow smelt (*Osmerus mordax*). Furthermore, the NRC states that additional mitigation for the cooling system components and operations may further reduce impingement and entrainment impacts.

We note the NRC's position that operational activities including the intake of cooling water, the discharge of heated effluent, and/or mitigation conditions are under the sole authority of the US Environmental Protection Agency (EPA) through their National Pollutant Discharge Elimination System (NPDES) permitting process, pursuant to Section 316(a)(b) of the Federal Clean Water Act. As such, the NRC does not intend to incorporate any mitigation conditions to offset impacts on NMFS trust resources. As noted within the GEIS, the EPA is currently in the process of developing a demonstration document for the reissuance of the NPDES permit. Based on this information, NMFS has determined that our issues of concern relative to living marine resources and EFH would be most appropriately addressed through the EPA's NPDES permit renewal process. As such, NMFS will not be providing the NRC with EFH conservation recommendations regarding the License Renewal for the Pilgrim Nuclear Power Plant. Rather, NMFS will

perform a detailed review of the proposed project within the NPDES permit renewal process and potentially provide EFH conservation recommendations at that time.

Although NMFS is concluding the EFH consultation without providing conservation recommendations, we strongly encourage the NRC to continue to characterize and evaluate impacts on EFH and other living marine resources as part of its National Environmental Policy Act review process. Please note that these comments refer to the NRC's consultation with NMFS relative to the MSA and the FWCA. Comments relative to the Section 7 Endangered Species Act consultation will be provided by NMFS Protected Resources Division under separate cover. Should you have questions regarding these comments, please contact Christopher Boelke at (978) 281-9131. Thank you for your continued coordination with our agency on this important project.

Sincerely,

Peter D. Colosi, Jr.
Assistant Regional Administrator
for Habitat Conservation

Cc: David Webster, US EPA
John Nagle, US EPA
Alicia Williamson, NRC
Colligan, Crocker, PRD

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

February 8, 2007

Rani Franovich
Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation
Washington, D.C. 20555-0001

RE: Pilgrim Nuclear Power Station License Renewal Application, Plymouth, MA. MHC #RC.36661.

Dear Ms. Franovich:

Thank you for submitting information to the Massachusetts Historical Commission (MHC) regarding the proposed project referenced above. Staff of the MHC have reviewed the information submitted by the U.S. Nuclear Regulatory Commission (NRC) and have the following comments.

MHC requests that the NRC modify their finding of "no historic properties affected" (36 CFR 800.4(d)(1)), by indicating that this finding is contingent on NRC conditioning the relicensing. The NRC should require as a relicensing condition that if post-license renewal land disturbance or new construction is proposed, then project plans will be provided to the MHC for review, comment, and consultation in accordance with 36 CFR 800.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and Massachusetts General Laws, Chapter 9, Sections 26-27C (950 CMR 71). If you have any questions concerning this review, please feel free to contact Gregory R. Dubell, at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: Cheryl Andrews-Maltais, THPO, WTGH(A)
Plymouth Historical Commission

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JUL-06-2007 15:38 P.02

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

May 30, 2007

Stephen J. Bethay
Director, Nuclear Assessment
Entergy Nuclear Operations Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Rd
Plymouth, MA 02360

RE: Pilgrim Nuclear Power Station, Plymouth, MA. MHC #RC.36661.

Dear Mr. Bethay:

Thank you for your inquiry to the Massachusetts Historical Commission concerning MHC's comments to the Nuclear Regulatory Commission concerning the proposed license renewal application. MHC commented on February 8, 2007, that if future land disturbance or new construction were proposed, that project plans be submitted to this office for review and comment, consistent with 36 CFR 800.

The procedures established under 36 CFR 800 are the responsibility of the NRC. MHC, as the Office of the State Historic Preservation Officer (SHPO) is a consulting party. MHC is not yet informed of NRC's determination in light of MHC's comments. Please contact the NRC regarding the status of their review. It is especially advised that you provide a copy of any comments to MHC also to the NRC, as all determinations under these environmental review procedures are the NRC's responsibility.

The procedures established as Entergy Procedure EN-EV-121 (Cultural Resources Protection Plan) and EN-EV-115 (Environmental Reviews and Evaluations) are not consistent with 36 CFR 800. MHC notes that proposed activities involving land disturbance or modifications of facilities are reviewed by the in-house Site Environmental Representative (SER) who may or may not decide to notify the SHPO and there is no mention of Tribal Historic Preservation Officers (THPOs). MHC cannot determine where the "Protected Fence Area" containing the "power block area" may be in relation to the property boundaries, but the procedures propose to exclude any environmental review of undertakings in this area. Several of the procedures that do require notification of the SHPO are reactive rather than proactive, and may occur after a project has already proceeded. Responsibility for determining whether or not proposed activities may affect significant cultural resources or may be within areas that may contain significant but as yet unidentified cultural resources appears to be the purview of the SER and other employees. Yet there is no indication these individuals meet the Secretary of Interior's Professional Qualifications Standards (36 CFR Part 61), nor have the requisite regional professional experience in New England archaeology (e.g. 950 CMR 70.10). The "land disturbance environmental review form" is not adequate to the task because in New England archaeological sites are typically buried and have no obvious surface indications.

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MHC recommends consultation with NRC to further refine your in-house planning procedures to be consistent with 36 CFR 800, to include SHPO and THPO notifications of proposed undertakings early in the planning stage, to consult with the SHPO, THPOs, and other consulting parties on the need and scope of any identification survey that may be needed, to evaluate the results of survey findings, to apply the criteria of adverse effect, to consult on feasible alternatives to adverse effects, and to develop plans as part of an agreement document outlining how the undertaking will be implemented to take into account the results of the consultation. Unexpected discoveries are treated in accordance with 36 CFR 800.13. Discoveries of human remains are treated in accordance with the Massachusetts Unmarked Burial Law (MUBL) (Massachusetts General Laws, Chapter 38, Section 6; Chapter 9, Section 26A and 27C; and, Chapter 7, Section 38A; all as amended). A fact sheet on the MUBL can be found at http://www.sec.state.ma.us/mhc/mhcpdf/kn4.pdf.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). Please contact Edward L. Bell if you have any immediate questions concerning these comments.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc:
Rani Franovich, NRC
Laura Dean, ACHP
Cheryl Andrews-Maltais, THPO, WTGH(A)

Appendix E

Biological Assessment for Pilgrim Nuclear Power Station

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Biological Assessment

Pilgrim Nuclear Power Station
License Renewal

December 2006

Docket Number
50-293

U.S. Nuclear Regulatory Commission
Rockville, Maryland

Biological Assessment of the Potential Effects on Endangered or Threatened Species from the Proposed License Renewal for the Pilgrim Nuclear Power Station

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) issues operating licenses (OLs) for domestic nuclear power plants in accordance with the provisions of the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. The purpose and need for this proposed action (renewal of the OL for Pilgrim Nuclear Power Station [PNPS]) is to provide an option that permits electric power generation to continue beyond the term of the current nuclear power plant OL. This would allow future electric generating needs to be met, if the operator and State regulatory agencies pursue that option.

The NRC is reviewing an application submitted by Entergy Nuclear Operations, Inc. (Entergy) for the renewal of OL DPR-35 for PNPS for 20 years beyond the current OL expiration date. Entergy has prepared an Environmental Report (ER) as part of its application for the renewal of the PNPS OL. The ER (Entergy 2006) addressed the requirements of the following NRC regulations:

- Title 10, *Energy*, Code of Federal Regulations (CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," Section 54.23, Contents of application – environmental information (10 CFR 54.23).

- Title 10, *Energy*, CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Section 51.53, Postconstruction environmental reports, Subsection 51.53(C), OL renewal stage [10 CFR 51.53(C)].

- Title 10, *Energy*, CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Section 51.45, Environmental reports – general requirements (10 CFR 51.45).

In addition, the ER addressed the underlying intent of the National Environmental Policy Act of 1969, as amended (NEPA), 42 USC 4321 *et seq.*, and followed the guidance of Supplement 1 to Regulatory Guide 4.2 – Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses. In the ER, Entergy analyzed the environmental impacts associated with the proposed license renewal action, considered alternatives to the proposed action, and evaluated mitigation measures for reducing adverse environmental effects. The NRC is using the ER and other information as the basis for a

Supplemental Environmental Impact Statement, a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, NUREG-1437*.

This biological assessment examines the potential effects of the continued operation of PNPS on ten Federally listed species that could occur within the PNPS site or near the site. This consultation is pursuant to Section 7(e)(2) of the Endangered Species Act of 1973, as amended (ESA).

In a letter dated April 25, 2006, the NRC staff requested that the National Marine Fisheries Service (NMFS) provide lists of Federally listed endangered or threatened species and information on protected, proposed, and candidate species, as well as any designated critical habitat, that may be in the vicinity of PNPS (NRC 2006). The project area is defined as the PNPS site, adjacent areas of Cape Cod Bay, and approximately 7.2 miles (mi) of transmission line right-of-way (ROW). Cape Cod Bay serves as the source of cooling water for the power station. In a letter from the NMFS (NMFS 2006a), the NRC was provided with a list of Federally protected species in the project area. A total of ten aquatic species under NMFS jurisdiction that are afforded protection under the ESA, were identified as having the potential to inhabit the project area.

2.0 The Proposed Federal Action

The proposed action is the renewal of the OL for PNPS. PNPS is located in the Town of Plymouth, Plymouth County, Massachusetts, on the western shore of Cape Cod Bay. The location of the facility, and the areas within 50-mi and 6-mi radii, are shown in Figures 2-1 and 2-2, respectively. The current OL expires on June 8, 2012. Entergy has submitted an application to the NRC to renew this license for an additional 20 years of operation, until June 8, 2032.

There would be no major construction, refurbishment, or replacement activities associated with the license renewal. If the NRC approves the license renewal application, the reactor and support facilities, including the cooling system, would be expected to continue to be operated and maintained until the renewed license expires in 2032. Maintenance activities would also continue to be performed on the transmission lines that connect PNPS to the electric grid, including inspection, surveillance, and vegetation management within the ROW.

Figure 2-1. Location of PNPS, 50-mile radius

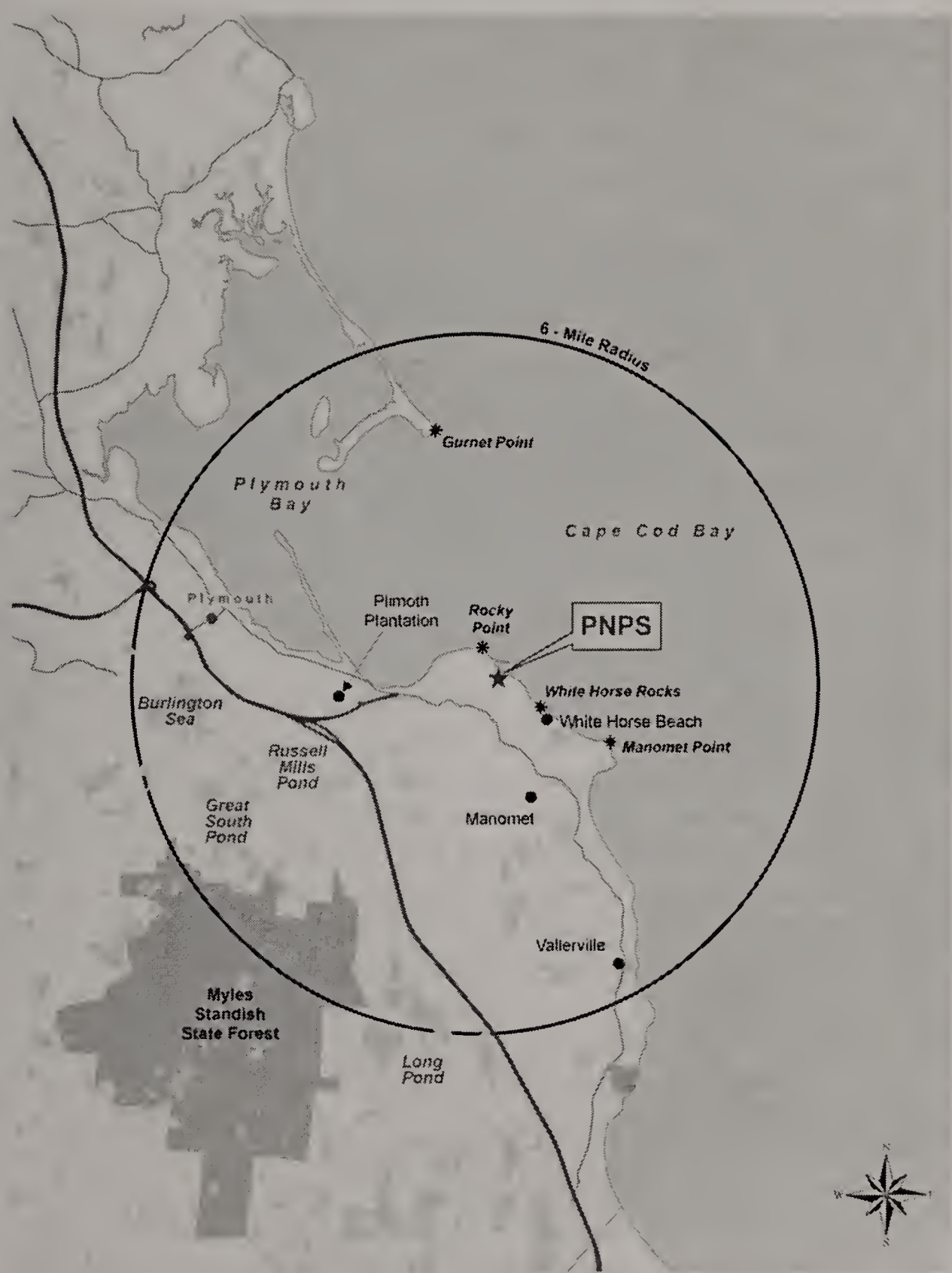

Figure 2-2. PNPS, 6-mile radius

3.0 The Plant and Associated Transmission Line System

3.1 Reactor Systems

The principal facilities present at the PNPS site include the reactor and turbine buildings, an offgas retention building, a radwaste building, a diesel generator building, an administration building, the cooling water intake structure, and the main stack. The facility operates a single reactor unit with a boiling water reactor design and turbine generator manufactured by General Electric. The facility has a licensed output of 1998 megawatts-thermal and a current electrical rating of 715 megawatts-electric. The fuel used by the facility is low-enriched uranium dioxide with maximum enrichment of 4.6 percent by weight uranium-235 (Entergy 2006).

The primary containment for the reactor is a pressure suppression system that contains a drywell, a pressure suppression chamber, a vent system, isolation valves, and a containment cooling system connected to the water intake system. This system is enclosed within a secondary containment structure (Entergy 2006).

3.2 Cooling and Auxiliary Water Systems

The cooling and service water systems at PNPS operate as a once-through cooling system, with Cape Cod Bay being the water source. Seawater is withdrawn from the bay through an intake embayment formed by two breakwaters (Figure 3-1). The intake structure consists of wing walls, a skimmer wall that functions as a submerged baffle, slanted vertical trash racks that capture large debris, vertical traveling screens to reduce entrainment, fish return sluiceways, condenser cooling water pumps, and service water pumps (Figure 3-2). The two wing walls are constructed of concrete, and guide flow into four separate intake bays. Each wing wall extends from the face of the intake structure at a 45 degree angle, one at a distance of 130 feet (ft) to the northwest and the other 63 ft to the northeast. The entrance of the intake measures 62 ft wide at the stop log guide, and extends to the floor of the intake structure at 24 ft below mean sea level (MSL). The skimmer wall at the front of the intake removes floating debris, with the bottom of the wall extending to 12 ft below MSL. Fish are able to escape the system by way of approximately 6 to 12 10-inch (in.) circular openings that are located in the skimmer walls and at each end of the intake structure. Divers have visually verified that the escape openings are effective. Bar racks behind the skimmer wall intercept large debris. The racks are constructed of 3 in. by 3/8 in. rectangular bars, with a 3 in. opening between each bar. Debris and large, impinged organisms are removed from the bar racks using a mechanical rake.

Located in the seawater pump wells of the intake structure, two vertical, mixed-flow, wet-type pumps provide a continuous supply of condenser cooling water. Each 1450 horsepower (hp) pump has a capacity of 155,500 gallons per minute (gpm) (346.5 cubic ft per second [cfs]).

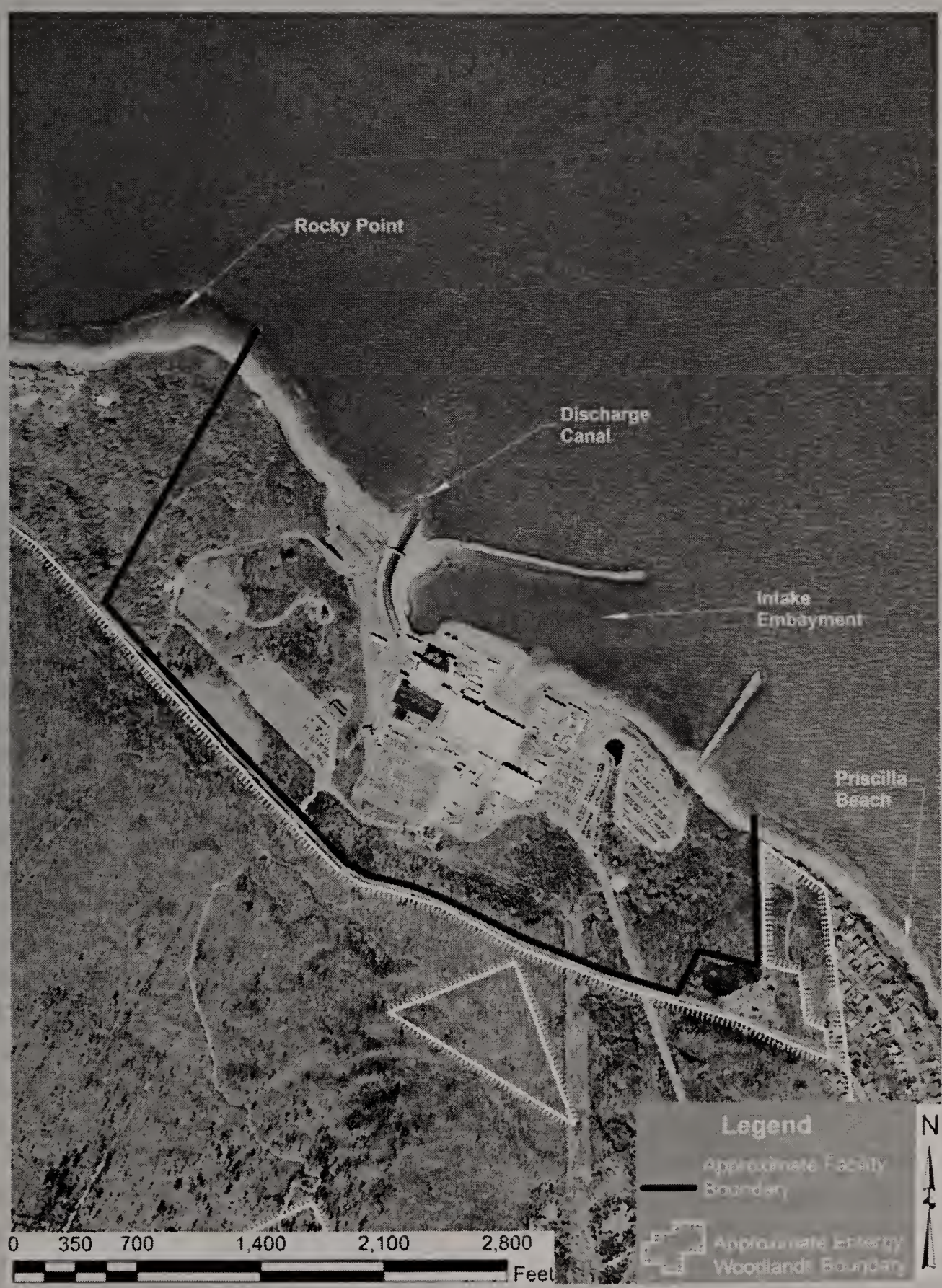

Figure 3-1. Intake System Map

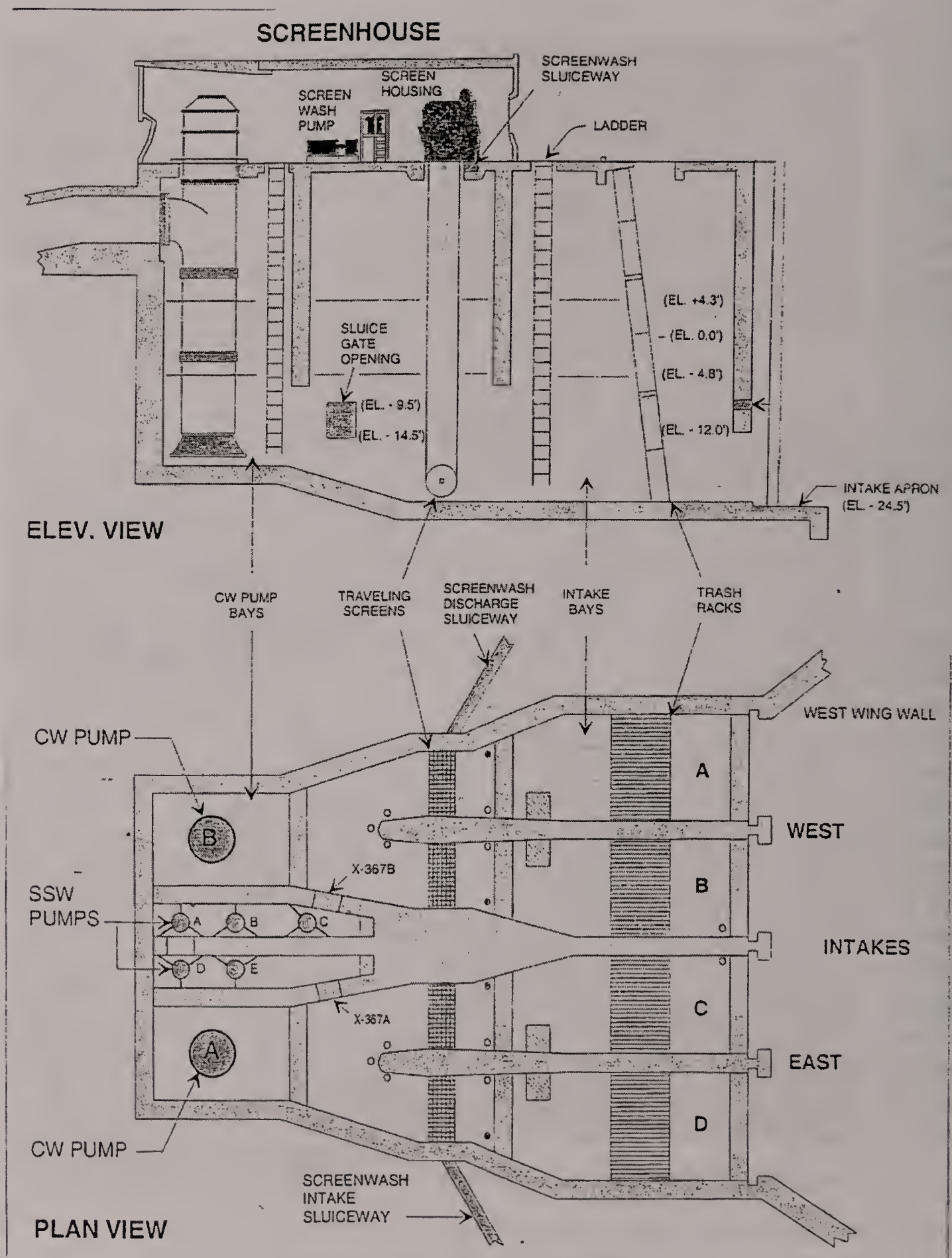

Figure 3-2. PNPS Intake Structure (Source: ENSR 2000)

The water is pumped from the intake structure to the condensers via two buried concrete pipes measuring 7.5 ft in diameter. Measurements taken at the breakwaters during mid-tide level with both pumps running indicate that the average intake velocity is 0.05 ft per second (fps). At the intake, before the screens, the velocity is about 1 fps during all tidal conditions. Through the traveling screens, the velocity is about 2 fps. The velocity is approximately 0.15 fps near the end of the east fish-return sluiceway, which is located in the intake embayment just east of the intake structure.

Located in the central wet well of the intake structure are five service water pumps that supply the service water system. Generally, four pumps run while one is kept on standby. Each pump has a capacity of 2500 gpm, providing a combined capacity at normal operation of approximately 10,000 gpm. The service water system is continuously chlorinated in order to control nuisance biological organisms in the service water discharge. Diffusers located downstream of the trash or bar racks deliver a 12 percent sodium hypochlorite and seawater mixture to each intake bay. The mixture is used to ensure the total residual chlorine discharge concentration does not exceed a maximum daily concentration of 0.10 parts per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge.

Chlorination of the main cooling water system also takes place, but not on a continuous basis. Hypochlorination events occur during spring, summer, and fall, when the circulating water system is chlorinated for up to two hours per day (one hour for each pump). A chlorine solution is added inboard of the trash rack to control fouling.

From intake to discharge, the travel time for water to move through the system varies from 5 to 10 minutes, depending upon whether one or two intake pumps are in service. The tidal stage affects pump output, also causing changes in the transit time. In addition to dye dilution studies conducted in the 1980s, the transit time has been estimated during chlorination events. During these chlorination events, chlorine is added outboard of the intake screens and monitored readings are taken in the discharge canal. Residual chlorine is typically detected approximately 5 minutes into the cycle. Since the chlorination events are usually conducted only when both pumps are running, it has been estimated that the transit time would be twice as fast when operating only one pump.

Prior to water flowing through either the cooling water pumps or the service water pumps, water passes through one of four 10-ft-wide traveling screens. The screens work to prevent small debris and small aquatic organisms from being entrained into the cooling water or service water systems. Each screen is constructed of 53 segments with ¼ in. by ½ in. stainless steel wire mesh. Each segment has a stainless steel lip that is used to lift debris and organisms and direct them into the fish return sluiceway.

The traveling screens are not operated continuously but are operated during any of the following scenarios:

- When the difference in water level on each side of the screen reaches a specified threshold at an alarm set point. The threshold is typically set at 6 in. This level difference signifies that too much debris has collected on the screen. Level differences are rare, and usually the result of a storm event.

- When there is an indication that fish are being impinged at a rate exceeding 20 fish per hour, at which time the traveling screens are turned continuously until the impingement rate drops below 20 fish per hour for two consecutive sampling events. Each impingement sampling event is conducted for a minimum of 30 minutes, 3 times per week.

- During marine life monitoring. The screen wash which occurs during screen rotations, is scheduled for eight hours prior to each of the three weekly sampling events.

- During hypo-chlorination, which occurs each day for two hours when the main cooling water system is chlorinated inboard of the trash rack to control fouling.

- Whenever water temperatures are less than 30°Fahrenheit (F).

- At a minimum, once per each 12-hour shift. This usually occurs at the beginning and end of each shift, and will usually last for a few hours.

On average, the traveling screens rotate 3 to 4 times each day. The screens normally operate at 5 fps, but can be accelerated to 20 fps during storm events that are causing extreme debris loading.

The screens are washed when they are in operation, using a dual-level spray wash. Service water is used as the source for the spray wash. Sodium thiosulfate is added to the wash water to remove chlorine and protect organisms returned to the intake embayment. The screens are washed from the side that faces the approaching flow at the splash housing, which is located about 46 ft above the bottom of the intake structure. Low pressure spray, about 20 pounds per square inch (psi), removes light fouling and organisms from the screen. Subsequently, a high pressure wash, about 100 psi, is applied to remove heavy fouling. The low and high pressure washes are about 18 to 24 inches apart. The screen rotation rate is kept slow during high impingement events.

Impinged fish are washed into a seamless concrete fish-return sluiceway and usually returned to the intake embayment approximately 300 ft east of the intake structure. The original west sluiceway was installed in 1972 and was connected to the discharge canal. In 1979, the east

sluiceway was installed and connected to the intake embayment. During storms, the wash is discharged via the original sluiceway to the discharge canal. An interchangeable baffle plate is utilized to divert the flow to one sluiceway or the other from the screenhouse. The baffle plate will direct organisms and debris; however, some water will flow over this structure and into the alternate sluiceway. The new sluiceway was designed to maintain a minimum 6-in. depth and a water velocity of less than 8 fps and is covered with galvanized wire screen. Though there are several turns in the sluiceway, none appear to be greater than 23 degrees. The discharge point of the east sluiceway is at the mean low water (MLW) level. On occasion, the end of the east sluiceway has been seen above the water level, causing an actual "free fall" scenario. The west sluiceway discharge is above the MLW level in the discharge canal.

Under normal operation, seawater is heated in the condensers to approximately 27 to 30°F above the intake temperature. This is within the plant's NPDES permit, which allows for as much as a 32°F temperature change. With the cooling water flow being relatively constant at 311,040 gpm (693 cfs) throughout the year, the discharge temperature is almost entirely a function of the intake water temperature. The permitted change in temperature across the service water is 5 to 10°F. From the condensers, water flows through a buried concrete conveyance to the discharge canal. The conveyance consists of 235 ft of 13 ft by 17 ft reinforced concrete box culvert, followed by 250 ft of a concrete pipe that is 10.5 ft in diameter.

Three to five times each year, the plant is reduced to 50 percent power, and a thermal backwash is conducted to control biological fouling. During the backwash, water is heated to about 105°F, and two of the four traveling screens are rotated in reverse, allowing heated, non-chlorinated seawater from the condensers to flow back over the screens and to the intake embayment. The treatment is maintained for about 35 minutes. Scheduling of the thermal backwash treatments is coordinated with the highest tide to achieve maximum coverage, preventing mussels from growing in the upper elevations of the intake structure.

Upon exiting the concrete pipe, discharged water enters a 900-foot-long trapezoidal discharge canal separated from the intake embayment by a breakwater. The discharge canal is created by two breakwaters that are oriented perpendicular to the shoreline, one of which is shared with the intake embayment. The channel sides are sloped at a 2:1 horizontal to vertical ratio. The bottom is 30 ft wide at an elevation of 0 ft MLW, or 4.8 ft below MSL. The channel bottom remains at this elevation until it converges with the shore, which has a slope of approximately 40:1 at the channel mouth. At low tide, the water in the discharge canal is several feet higher than sea level, and the discharge is rapid and turbulent (estimated at 8.1 fps). At high tide, the velocity is much lower (estimated at 1.4 fps) because the cross sectional area of flow in the channel is greater. Discharge of the heated water creates a thermal plume in the nearshore area of PNPS.

Dredging of the discharge canal has never been conducted. The intake embayment has been dredged twice, once in 1982 and again in the late 1990s. The purpose of dredging in the

1990s, though unsuccessful, was to bring colder water into the cooling water system. Each dredging event was individually permitted through the U.S. Army Corps of Engineers (USACE). The potential dredge material was tested as part of the permit, undergoing chemical, biological, and radiological analyses (see Section 2.2.5.2). The sediments were described as having relatively low concentrations of the chemical parameters tested [polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, petroleum hydrocarbons, heavy metals], and thus considered to be Category One material under the Massachusetts Department of Environmental Protection (MDEP) dredged material classification guidelines and being suitable for disposal (BSC Group 1996). Of the three potential categories of dredged material, a Category One classification has the lowest amount of contaminants. The dredged material was disposed of in open water, at the Massachusetts Bay Disposal Site, north of Boston.

3.3 Power Transmission System

The facility is connected to the electric power grid by two transmission lines, referred to as the 342 line and the 355 line (Figure 3-3). The two lines share a single 300-ft-wide transmission line ROW that extends from the PNPS switchyard approximately 5.0 mi to the Jordan Road Tap, and then the ROW extends an additional 2.2 mi to the Snake Hill Road substation (Entergy 2006a; AEC 1972) (Figure 2-6). Over its 7.2 mi length, the ROW covers approximately 260 ac. The transmission line ROW does not cross any State or Federal parks, wildlife refuges, or wildlife management areas (Entergy 2006a), nor does it cross any major lakes, ponds, or streams. However, the transmission line crosses a small stream near Old Sandwich Road.

Entergy does not own, operate, or maintain the PNPS-to-Snake Hill Road transmission ROW or transmission lines. The lines are owned and maintained by NSTAR, which provides electricity and natural gas to businesses and residents in eastern Massachusetts (Entergy 2006a; NSTAR 2006). NSTAR maintains the transmission ROW in accordance with a Vegetation Management Plan (NSTAR 2006) approved by the Massachusetts Department of Agricultural Resources and the Natural Heritage and Endangered Species Program (NHESP). Under this plan, NSTAR maintains the PNPS ROW from the station to the Snake Hill Road substation, as well as the rest of their system, using an integrated vegetation management program. The ROW is managed by NSTAR to encourage the natural development of low-growing woody shrubs and herbaceous plant communities while controlling tall growing trees and undesirable shrub species that may interfere with the operation of the transmission lines. The program is conducted in a manner to protect wetland areas and sensitive plant communities that are crossed by the ROW, and the timing of maintenance is scheduled with consideration of the life cycles of species located within the ROW (Entergy 2006).

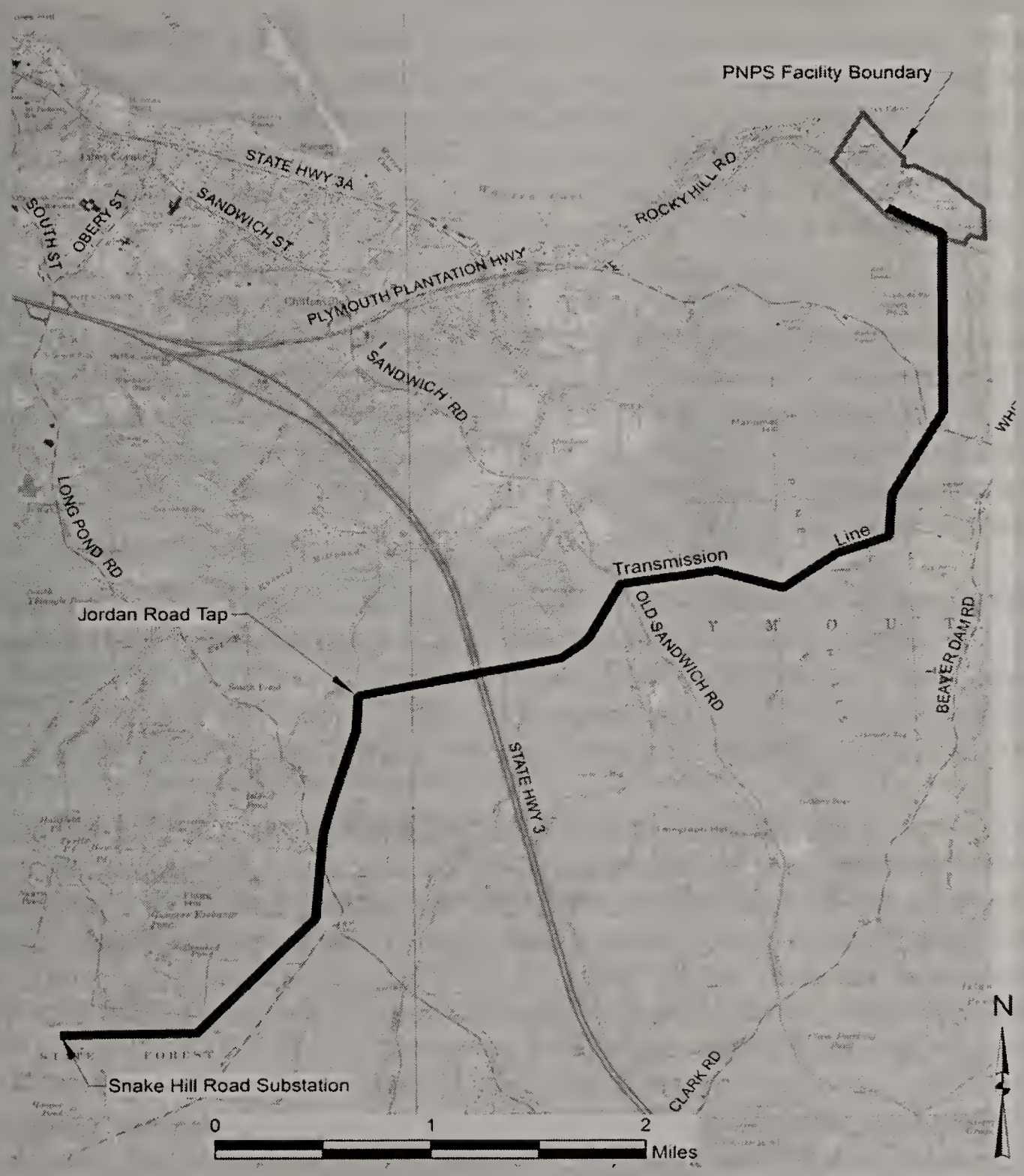

Figure 3-3. Transmission Lines

4.0 Aquatic Resources

Aquatic resources in the vicinity of PNPS are associated with the marine environment within Cape Cod Bay. The seawater of the bay is the source of the cooling water for the once-through reactor cooling system of PNPS, as well as service water for the station. The bay also receives the heated water discharged from the station. There are no other major water bodies on or adjacent to the PNPS property, and there are no major water bodies crossed or paralleled by the transmission line ROW.

Cape Cod Bay is a large embayment in southeastern Massachusetts that covers an area of approximately 365,000 acres (Entergy 2006). The bay is open to the north to the Gulf of Maine, and is enclosed by the mainland to the west and Cape Cod to the south and east. The volume of the bay is approximately 36 million acre-ft (4.5 km^3) (Stone and Webster 1975 in ENSR 2000). Circulation patterns within the Gulf of Maine are counter-clockwise, resulting in a generally southward flow of cold ocean currents from the Labrador Current along the Massachusetts coast (Tyrrell 2005).

Water depths in the vicinity of PNPS are typically 10 ft and up to 35 ft several mi offshore of the site. The nearshore depths to the north of PNPS average approximately 12 ft deep. The greatest depth, approximately 180 ft, occurs at the mouth of the bay. The bottom of the bay is primarily mud (Tyrrell 2005), but the sea floor in the vicinity of PNPS is generally sandy, with depths of approximately 21 ft offshore and to the south of PNPS (ENSR 2000).

The movement of water within Cape Cod Bay is controlled mainly by tidal exchange, ocean circulation patterns, and wind (Entergy 2006). Ocean currents in the vicinity of the PNPS are generally toward the south and are part of the large-scale, counterclockwise circulation pattern within Massachusetts Bay. In contrast, tidal currents tend to rotate clockwise, completing one revolution per tide cycle (EG&G 1995 in ENSR 2000). Historical investigations of current velocities in Cape Cod Bay have indicated that net surface velocities range from 1.3 ft/min to as much as 30.4 ft/min (ENSR 2000).

The aquatic habitat within Cape Cod Bay includes numerous species that are commercially, recreationally, or ecologically important. The species present in the western portion of Cape Cod Bay reflects a transition between the aquatic habitats in the Gulf of Maine to the north and the Mid-Atlantic Bight to the south (Lawton *et al.* 1995 in ENSR 2000). Cape Cod is approximately the southern boundary of the ranges of many northern Atlantic fish species and the northern boundary of the ranges of many warmer water species (ENSR 2000). Because PNPS is situated on an open part of the coast, and not within an estuary or embayment, the species in the vicinity of the station are more typical of marine than of estuarine environments (ENSR 2000).

5.0 Evaluation of Federally Listed Endangered and Threatened Species

Ten Federally listed marine species could occur in Cape Cod Bay in the vicinity of PNPS. These include five whale species, four sea turtle species (NMFS 2006a), and one fish species (Table 5-1). Protected marine species are those that are Federally protected under the ESA and listed by the U.S. Fish and Wildlife Service (FWS) and/or the NMFS.

Table 5-1. Marine Aquatic Endangered and Threatened Species

Scientific Name	Common Name	Federal Status
	TURTLES	
Caretta caretta	loggerhead turtle	Threatened
Chelonia mydas	green turtle	Threatened (endangered in FL)
Dermochelys coriacea	leatherback turtle	Endangered
Lepidochelys kempii	Kemp's ridley turtle	Endangered
	WHALES	
Balaenoptera borealis	sei whale	Endangered
Balaenoptera physalus	fin whale	Endangered
Eubalaena glacialis	North Atlantic right	Endangered
Megaptera novaengliae	humpback whale	Endangered
Physeter catadon	sperm whale	Endangered
	FISH	
Acipenser brevirostrum	shortnose sturgeon	Endangered

Source: FWS 2006b

Many sea turtle species migrate north in summer months, and may be found in Cape Cod Bay (Prescott 2000 in Entergy 2006). The loggerhead turtle (*Caretta caretta)* is the most common visitor to Cape Cod Bay, followed by the leatherback (*Dermochelys coriarea)*, green (*Chelonia mydas)*, and Kemp's ridley (*Lepidochelys kempii)* turtles (Prescott 2000). In late fall and winter, sea turtles still present in the Bay may become cold-stunned, and wash ashore (Entergy 2006). This typically includes fewer than 20 sea turtles in any given year. The largest incident recorded was in the winter of 1999-2000, when a total of 277 sea turtles were found on Cape Cod beaches (Entergy 2006). In 2003, the total number of turtles found stranded was 89 (Mass Audubon 2005 in Entergy 2006). Records have been maintained on turtle strandings in Massachusetts for 25 years, and in that time, only one sea turtle has been stranded in the Plymouth area (Entergy 2006). This incident occurred in November 2003, when a small (approximately 50 pounds) loggerhead sea turtle was stranded on Priscilla Beach approximately

0.63 mi south of PNPS (Prescott 2005 in Entergy 2006). No impingement of sea turtles has been observed at PNPS.

Six species of great whales, five of which are federally listed, migrate along the Massachusetts coast, with the largest number sighted in the spring on Stellwagen Bank off of the tip of Cape Cod (Entergy 2006). The most common species seen in this area are minke (*Balaenoptera acutorostrata*), fin (*B. physalus*), and humpback (*Megaptera novaengliae*) whales (Entergy 2006). North Atlantic right whales (*Eubalaena glacialis*) may be found in Massachusetts and Cape Cod Bays throughout the year (Brown *et al.* 2002 in Short and Michelin 2006), and Cape Cod Bay has been designated as critical habitat for the species (Entergy 2006). Sei whales (*B. borealis*) are rarely sighted in Massachusetts and Cape Cod Bays (EPA 1993 in Short and Michelin 2006). Sperm whales (*Physeter catadon*) are deep water whale that would not be expected in Cape Cod Bay (Provincetown Center for Coastal Studies 2006).

The applicant has been monitoring aquatic communities in western Cape Cod Bay since 1969. No Federally endangered or threatened species have ever been observed in Cape Cod Bay near PNPS, or in the facility intake and discharge areas, during the duration of these studies (Entergy 2006).

Following are detailed discussions of the potential impacts of the proposed action on these ten Federally listed species.

Loggerhead Turtle (*Caretta caretta*)

The loggerhead turtle is the most abundant species of sea turtle found in U.S. coastal waters (NMFS 2006g). The species is Federally listed as threatened throughout its range, which includes temperate and tropical regions in the Atlantic, Pacific, and Indian Oceans (NMFS 2006g). In the Atlantic, loggerhead turtles are found from Newfoundland to Argentina, with the primary nesting sites in the U.S. ranging from North Carolina to southwest Florida (NMFS 2006g). The species can live in water temperatures as low as 11° Celsius (C) and can be present in New England waters from June 1 to November 30, when water temperatures exceed 16°C (NMFS 2006a).

Loggerhead turtles hatch on ocean beaches and immediately swim to offshore areas, where they feed on floating items (NMFS 2006g). Once in the ocean, loggerheads live within the top 5 meters (m) (15 ft) of the water column and are carried by ocean currents. They live offshore for a period of 7 to 12 years, at which time the juveniles migrate to nearshore coastal areas, including bays, sounds, and estuaries in Massachusetts (NMFS 2006g). The species becomes sexually mature and begins to mate at an age of about 35 years (NMFS 2006g).

Population estimates are based on studies of the nesting populations, primarily in southeastern Florida. Based on these studies, the population of loggerheads is thought to be declining (NMFS 2006g). The primary threats to the species are incidental capture in fishing gear, and continuing directed harvesting in some areas (NMFS 2006g). The species is protected by various international agreements. In the U.S., NMFS is the lead agency for the sea turtles in the marine environment, and FWS has jurisdiction over the nesting beaches. The species was placed on the endangered species list in 1978, and in 1991, NMFS and FWS finalized a recovery plan for loggerheads. Critical habitat has not been designated for the loggerhead turtle (FWS 2006d).

No loggerhead turtle has ever been observed at PNPS. On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the loggerhead turtle.

Kemp's Ridley Turtle (*Lepidochelys kempii*)

The Kemp's ridley turtle is listed as endangered throughout its range, and is the most critically endangered of the sea turtle species (FWS 2006). The range for the species includes the Gulf of Mexico and the western Atlantic coast from the Gulf of Mexico to Newfoundland (FWS 2006). The primary nesting sites for the species are on the coast of Tamaulipas and Veracruz, Mexico; some minor nesting has been known to occur in Texas, Florida, South Carolina, and North Carolina (FWS 2006). The species can live in water temperatures as low as 11°C, and can be present in New England waters from June 1 to November 30, when water temperatures exceed 16°C (NMFS 2006a).

After hatching, the juvenile turtles are dispersed throughout the Gulf of Mexico and Atlantic Ocean by surficial ocean currents until they reach the age of about two years (FWS 2006b). From the age of two years, the turtles live within coastal shallow water habitats (FWS 2006b). The Kemp's ridley turtle was placed on the endangered species list in 1970; critical habitat has not been designated (FWS 2006b).

Population estimates for the species are based on inventories of nesting sites. The number of nesting sites declined from over 40,000 in 1947 to a low of 702 in 1985, primarily due to direct harvesting and entanglement in fishing equipment (FWS 2006b). Nest protection and implementation of fishery regulations requiring turtle excluder devices have allowed a rebound of the population, with more than 8,000 nests observed in 2003 (FWS 2006b).

No Kemp's ridley turtle has ever been observed at PNPS. On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the Kemp's ridley turtle.

Leatherback Turtle (*Dermochelys coriacea*)

The leatherback sea turtle is the largest of the sea turtles and can reach a weight of 2,000 pounds (NMFS 2006h). The species is listed as endangered throughout its range, which is global (NMFS 2006h). In the U.S., leatherback turtles nest in Puerto Rico, the U.S. Virgin Islands, and southeast Florida, and they have been found along the Atlantic coast as far north as the Gulf of Maine (NMFS 2006h). Leatherback turtles are expected to be present in New England waters in the summer months (NMFS 2006a).

Leatherback turtles are pelagic, but have been found to forage in coastal environments (NMFS 2006a). Nesting occurs on sandy beaches in tropical climates, with the largest nesting area being northern South America and western Africa (NMFS 2006h). The primary prey for the species is jellyfish (NMFS 2006h). The species is highly migratory, with adults known to nest in South America and travel as far north as Nova Scotia (NMFS 2006h).

Information on populations and trends is sparse because the adult females can nest on several different beaches within one mating season (NMFS 2006h). In the Pacific, available data suggest a decline of up to 80 percent in nesting populations. Nesting trends on U.S. beaches have been increasing, but since these are relatively minor nesting grounds, they may not be a good indicator of overall population trends (NMFS 2006h). The primary threats to the species are directed harvest of eggs, juveniles, and adults during nesting, as well as incidental capture in fishing gear (NMFS 2006h). The species is protected by various international agreements. The species was listed as endangered under the ESA in 1970 (FWS 2006c). Critical habitat is designated for the leatherback turtle in locations within the U.S. Virgin Islands (NMFS 2006h).

No leatherback turtle has ever been observed at PNPS. On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the leatherback turtle.

Green Turtle (*Chelonia mydas*)

The green turtle is listed as endangered in breeding populations in Florida, and as threatened in other areas of the U.S. (NMFS 2006i). The species' range is global, including coastal areas in tropical and subtropical climates (NMFS 2006i). In the U.S., the habitat includes inshore and nearshore waters from Texas to Massachusetts (NMFS 2006i). The species becomes sexually mature between the ages of 20 and 50 years, and females nest every 2 to 4 years on the same beaches where they were born (NMFS 2006i). Nesting in the U.S. occurs in the southeastern states and peaks in June and July (NMFS 2006i). Green turtles are expected to be present in New England waters only sporadically (NMFS 2006a).

After hatching, juveniles swim to offshore areas and are pelagic for several years, feeding on both plants and pelagic animals. As they grow larger, they move to inshore feeding areas, and feed entirely on sea grass and algae (NMFS 2006i).

Population assessments indicate that there has been a decline of 48 to 65 percent in nesting populations over the past 100 to 150 years (NMFS 2006i). The principal threats to the species include harvesting of eggs and adults in nesting areas, harvesting of adults and juveniles in feeding grounds, and incidental capture in fishing gear (NMFS 2006i). The species is protected by various international agreements. The species was listed under the ESA in 1978 (FWS 2006a). Critical habitat is designated for the green turtle in one location in Puerto Rico (NMFS 2006i).

No green turtle has ever been observed at PNPS. On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the green sea turtle.

North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale is the rarest of the large whale species, and is Federally listed as endangered throughout its range. The International Whaling Commission has identified four categories of right whale habitats, including feeding, calving, nursery, and breeding areas. Right whales primarily occur in coastal or shelf waters. During winter, calving occurs in low latitudes, including the southeastern U.S. In spring and summer, the whales migrate to higher latitudes, including the New England coast, for feeding and nursing (NMFS 2006b). New England waters are considered to be a primary feeding ground for the right whale, with the primary food source being copepods of the genera *Calanus* and *Pseudocalanus* (NMFS 2005).

This species was Federally listed as endangered in 1970. In 1994, NMFS designated three areas as critical habitat for the western population of the North Atlantic right whale, with one of the areas being Massachusetts Bay and Cape Cod Bay (NMFS 2006b). Right whales have been documented in the nearshore waters of Massachusetts from December through June, and are likely to be present in Cape Cod Bay from December 15 to April 15 (NMFS 2006a). Since studies began 40 years ago, 72 percent of the catalogued population of right whales has been documented to have visited Cape Cod Bay and Massachusetts Bay (Hamilton and Mayo 1990 in Short and Michelin 2006). The critical habitat for the right whale in Cape Cod Bay begins approximately 3 mi east of PNPS and extends south and east to the coastline and north beyond the tip of Cape Cod.

The right whale population within the western North Atlantic is estimated to number less than 300 individuals. A workshop convened by NMFS in 2002 to evaluate data on population trends concluded that the population was decreasing (Clapham 2002), and the NMFS Office of

Protected Resources website references a recent model that predicts that the species will be extinct within 200 years (NMFS 2006b). The primary human causes of serious injury and mortality to the western population of the North Atlantic right whale are ship collisions and entanglement in fishing gear. Habitat degradation, contamination, and climate and ecosystem change are also possible threats to the population (NMFS 2005).

On the basis of this information and that previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the North Atlantic right whale.

Humpback Whale (*Megaptera novaengliae*)

The humpback whale is Federally listed as endangered throughout its range and was placed on the endangered species list in 1970 (FWS 2006f). Critical habitat has not been designated for the humpback whale (FWS 2006f). There are four distinct stocks of humpback whales in U.S. waters, including a Gulf of Maine stock. The Gulf of Maine stock was reclassified as a separate stock from the North Atlantic stock following studies that showed that the population had a very strong fidelity to the Gulf of Maine area, and genetic analyses that showed a substantial separation of this population from other North Atlantic populations (NMFS 2005). This information suggested that depletion of the Gulf of Maine subpopulation would not be mitigated by migration from any of the other areas (NMFS 2005). Humpback whales inhabit shallow water on continental shelves, with summer ranges close to shore, including major coastal embayments (NMFS 2005). The Gulf of Maine stock mates and calves in the West Indies in winter, but there are recent incidents of humpback whale strandings and sightings during this time in the Chesapeake and Delaware Bays, along the Virginia and North Carolina coasts, and in the southeastern U.S. (NMFS 2005).

Humpback whales may be found off of the coast of Massachusetts during the period from March 15 to November 30 (NMFS 2006a). Humpback whales are documented in the Stellwagen Bank area from mid-April to November, with a peak abundance in May and June (CeTap 1982 in Short and Michelin 2006). The population of humpback whales is known to change through time in response to the availability of prey. In the 1970s, the population was seen to shift from its historical location in the Gulf of Maine to more inshore areas, including the Stellwagen Bank. This shift was attributed to the collapse of the herring population due to overfishing in the Gulf of Maine (Anthony and Waring 1980; and Grosslein *et al.* 1980 in Weinrich *et al.* 1997). By the mid 1990s, the population appeared to have shifted back to Jeffrey's Ledge in response to recovery of the herring population in that area (Weinrich *et al.* 1997).

The number of humpback whales in the North Atlantic population is approximately 11,500 (NMFS 2005), with approximately 900 whales within the Gulf of Maine stock (NMFS 2006f). The population data suggest that the Gulf of Maine stock is steadily increasing in size, but there are not enough data to make a judgment regarding trends in the overall North Atlantic

population (NMFS 2005). Because they inhabit relatively shallow coastal waters, humpback whales are susceptible to human activities, including subsistence hunting, entanglement in fishing equipment, ship collisions, disturbance by noise, and possible impacts from pollution and waste disposal (NMFS 2006f).

On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the humpback whale.

Fin Whale (*Balaenoptera physalus*)

The fin whale is Federally listed as endangered throughout its range (NMFS 2006c) and was placed on the endangered species list in 1970 (FWS 2006f). Critical habitat has not been designated for this species (FWS 2006f). Fin whales are common from Cape Hatteras to Nova Scotia, accounting for 46 percent of all large whale sightings in a study from 1978 to 1982 (CETAP 1982). The fin whale is reported to be the dominant species among cetaceans in all seasons, based on having the largest population with the largest food requirements (NMFS 2005). Information on the calving, mating, and feeding grounds for fin whales is limited, but New England waters are known to be a major feeding ground for the species (NMFS 2005). Data also suggest that there is substantial site fidelity in Massachusetts Bay and the Gulf of Maine, with repeated sightings of individuals within the same year and throughout multiple years (NMFS 2005). Fin whales are the most frequently sighted endangered whale species found in Massachusetts and Cape Cod Bays (EPA 1993 in Short and Michelin 2006).

The fin whale population in the western North Atlantic is estimated to number approximately 2,814 individuals. There are not enough data upon which to identify population trends at this time (NMFS 2005). The primary human cause of mortality is ship collisions, with an additional component from entanglement in fishing gear NMFS 2005).

On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the fin whale.

Sei Whale (*Balaenoptera borealis*)

The sei whale is Federally listed as endangered throughout its range (NMFS 2006e) and was placed on the endangered species list in 1970 (FWS 2006f). Critical habitat has not been designated for this species (FWS 2006f). The range of the sei whale covers the area from Cape Hatteras to Nova Scotia, with a concentration of spring, summer, and fall feeding in the Georges Bank area (NMFS 2005). Sei whales typically inhabit deep waters of the outer continental shelf, in areas of water depth of about 2,000 m (6,560 ft) (NMFS 2005). However, there are reports of episodic incursions into inshore waters, including the southern Gulf of Maine

(Schilling *et al.* 1993). Sei whales are only rarely sighted in Massachusetts and Cape Cod Bays (EPA 1993 in Short and Michelin 2006).

The size of sei whale population in the U.S. Atlantic Exclusive Economic Zone is unknown. Studies from the 1970s and early 1980s indicated a population of up to 2,248 individuals, but there are no recent data upon which to base current population trends (NMFS 2005). There are very few reports of human-caused mortality or injury, and the few that exist are all related to ship strikes (NMFS 2005).

On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20 year renewal period would have no effect on the sei whale.

Sperm Whale (*Physter macrocephalus*)

The sperm whale is Federally listed as endangered throughout its range (NMFS 2006d) and was placed on the endangered species list in 1970 (FWS 2006f). Critical habitat has not been designated for this species (FWS 2006f). Five different stocks of sperm whales are recognized in U.S. waters, including a North Atlantic stock. This population is concentrated east and northeast of Cape Hatteras in the winter, shifts northward to east of Delaware and Virginia in the spring, and is located offshore of New England in the summer and fall (NMFS 2005). The sperm whale is primarily found in water greater than 600 m (1970 ft) deep and is rarely found in water less than 300 m (984 ft) deep (NMFS 2006d). The sperm whale may be seasonally present in New England waters, but is typically found in deeper offshore waters (NMFS 2006a).

The sperm whale population in the western North Atlantic is estimated to number approximately 4,700 individuals, and the total worldwide population is between 200,000 and 1,500,000 individuals (NMFS 2006d). The sperm whale was extensively hunted between 1800 and 1987, with an estimate of about 1,000,000 whales taken (NMFS 2006d). Because the sperm whale inhabits deeper waters farther from shore, they are suspected to be less susceptible than coastal whale species to human-caused mortality and injury, including ship strikes, fishing, and pollutants (NMFS 2006d). There are currently not enough data upon which to determine population trends (NMFS 2005).

On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the sperm whale.

Shortnose Sturgeon (*Acipenser brevirostrum*)

The shortnose sturgeon is Federally listed as endangered throughout its range (NMFS 2006j) and was placed on the endangered species list in 1967 (FWS 2006c). Critical habitat has not

been designated for this species. The shortnose sturgeon is often confused with the Atlantic sturgeon (*Acipenser oxyrinchus*), but the two species can be distinguished by comparing the width of the mouths: the shortnose sturgeon has a much wider mouth than the Atlantic sturgeon. The shortnose sturgeon is amphidromous, which indicates that the fish spawns in freshwater but regularly enters marine habitats during its lifespan. The shortnose sturgeon spawns in fast-flowing, rocky rivers in April and May. There are three known shortnose sturgeon populations in Massachusetts: one in the Merrimack River in northeastern Massachusetts and two in the Connecticut River in the western portion of the state. There are no known occurrences of the shortnose sturgeon in the Town of Plymouth or the surrounding area (NHESP 2006); no shortnose sturgeon has ever been observed at PNPS.

On the basis of this information, and information previously provided for the aquatic resources in the vicinity of the plant, the staff has determined that continued operation of PNPS over the 20-year renewal period would have no effect on the shortnose sturgeon.

6.0 Conclusions

The staff has identified ten Federally listed endangered or threatened, species that are under full or partial NMFS jurisdiction, that have a reasonable potential to occur in the vicinity of PNPS, and, therefore, may be affected by continuing operations of PNPS. In addition, Entergy has ongoing ecological studies and monitoring systems in place to evaluate the impact of the facility on aquatic organisms and has not observed any interactions with any Federally endangered or threatened species.

The NRC staff has evaluated the species that are likely to be present in the vicinity of PNPS, the known distributions and habitat ranges of those species, the ecological impacts of the operation of PNPS on the species, and the studies and mitigation measures that Entergy employs to protect the species. Based on this analysis, the staff has determined that continued operation of PNPS for an additional 20 years would not have any adverse impact on any threatened or endangered marine aquatic species.

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Appendix E

Essential Fish Habitat Assessment
Pilgrim Nuclear Power Station

Essential Fish Habitat Assessment

Pilgrim Nuclear Power Station
License Renewal

Docket Number
50-293

U.S. Nuclear Regulatory Commission
Rockville, Maryland

December 2006

Assessment of the Potential Effects on Essential Fish Habitat from the Proposed License Renewal for the Pilgrim Nuclear Power Station

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) issues licenses for domestic nuclear power plants in accordance with the provisions of the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. The NRC is reviewing an application submitted by Entergy Nuclear Generation Company (the applicant) for the renewal of Operating License (OL) DPR-35 for Pilgrim Nuclear Power Station (PNPS) for 20 years beyond the current operating license expiration date. The current OL will expire at midnight on June 8, 2012. Entergy has submitted an application to the NRC to renew this license for an additional 20 years of operation, until June 8, 2032, and the proposed action evaluated in this assessment is the renewal of the OL.

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) identified the importance of habitat protection to healthy fisheries. The amendments known as the Sustainable Fisheries Act, strengthened the governing agencies' authority to protect and conserve the habitat of marine, estuarine, and anadromous animals (NEFMC 1999). Essential Fish Habitat (EFH) is defined as those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 USC 1801 et seq). Identifying EFH is an essential component in the development of Fishery Management Plans (FMPs) to evaluate the effects of habitat loss or degradation on fishery stocks and take actions to mitigate such damage. This responsibility was expanded to ensure additional habitat protection (NMFS 1999). The consultation requirements of Section 305(b) of the MSA provide that Federal agencies consult with the Secretary of Commerce on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.

PNPS is located in the Town of Plymouth, Plymouth County, Massachusetts, on the western shore of Cape Cod Bay. Cape Cod Bay serves as the source of cooling water for PNPS, and discharge water is discharged into the bay. Pursuant to the Endangered Species Act, a biological assessment regarding license renewal of PNPS has been provided to the National Marine Fisheries Service (NMFS).

On May 16, 2006, NRC staff met with NMFS staff to discuss the EFH consultation process. Discussions included a description of the overall re-licensing process and requirements for the EFH assessment. Additionally a letter was received from the NMFS on June 8, 2006 documenting some of the NMFS's requirements regarding the EFH assessment.

2.0 Proposed Federal Action

The proposed action is the renewal of the OL for PNPS. If approved and issued by the NRC, the renewed OL would allow up to 20 additional years of plant operation beyond the current licensed operating term. The renewed OL would be issued well in advance of the current OL's expiration date and would replace the existing OL. Therefore, if issued, the new PNPS OL would expire in 2032. No major refurbishment or replacement of important systems, structures, or components is expected during the 20-year PNPS license renewal term. In addition, no construction activities are expected to be associated with license renewal. If the NRC renews the license, the reactors and support facilities, including the cooling system, would be expected to continue to be operated and maintained until the renewed license expires in 2032.

3.0 Environmental Setting

The location of the facility, the areas within 50-mi and 6-mi radii, are shown in Figures 3-1 and 3-2, respectively. PNPS is located approximately 38 mi southwest of Boston, Massachusetts and 44 mi east of Providence, Rhode Island. The area within a 6-mi radius of the facility includes the town of Plymouth. Most of the area within the 6-mi radius is open water within Cape Cod Bay.

The facility, shown in Figure 3-3, comprises an area of approximately 140 ac. An additional 1500 ac of adjacent property owned by Entergy is in a forest management trust. One tract of privately owned land is contained within the Entergy land holdings, but it is located outside of the NRC-mandated, 1800-foot buffer between the reactor and the nearest residence.

Aquatic resources in the vicinity of PNPS are associated with the marine environment within Cape Cod Bay. The seawater of the bay is the source of the cooling water for the once-through reactor cooling system of PNPS, as well as service water for the station. The bay also receives the heated water discharged from the station. There are no other major water bodies on or adjacent to the PNPS property, and there are no major water bodies crossed or paralleled by the transmission line right-of-way.

Cape Cod Bay is a large embayment in southeastern Massachusetts that covers an area of approximately 365,000 ac (1,477 km^2) (Entergy 2006a). The bay is open to the north, and is enclosed by the mainland to the west and Cape Cod to the south and east. The volume of the bay is approximately 36 million acre-feet (4.5 km^3) (Stone and Webster 1975 in ENSR 2000).

Water depths in the vicinity of PNPS are typically 10 ft (3 m) and up to 35 ft (10.7 m) several miles offshore of the site. The nearshore depths to the north of PNPS average approximately 12 ft (3.7 m) deep. The greatest depth, approximately 180 ft (54.9 m), occurs at the mouth of the bay.

Figure 3-1. Location of PNPS, 50-mi Radius

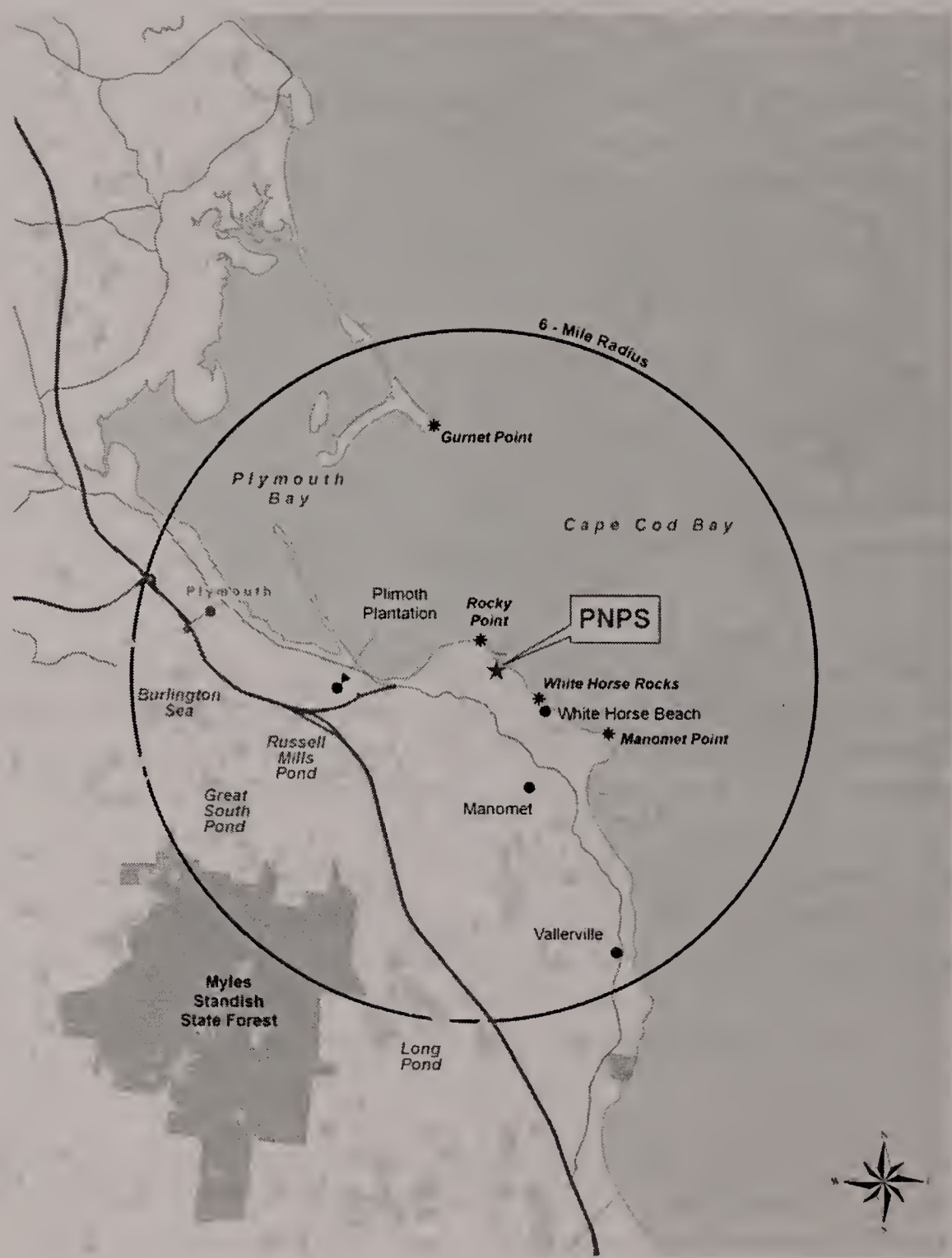

Figure 3-2. Location of PNPS, 6-mi Radius

Figure 3-3. Aerial Photograph Showing PNPS Property Boundaries and Environs.

The bottom is mainly unconsolidated sediment, finer in deeper waters than near shore (Bridges and Anderson 1984 in ENSR 2000). The sea floor in the vicinity of PNPS is generally sandy, with depths of approximately 21 feet offshore and to the south of PNPS. Two shallow rocky ledges bracket the PNPS area. One ledge extends northward from Rocky Point near the northern tip of the PNPS property. The other ledge also extends northward for several hundred meters from the vicinity of Manomet Point (ENSR 2000, Davis and McGrath 1984).

The movement of water within Cape Cod Bay is controlled mainly by tidal exchange, ocean circulation patterns, and wind (Entergy 2006a). Ocean currents in the vicinity of PNPS are generally toward the south and are part of the large-scale, counterclockwise circulation pattern within Massachusetts Bay. In contrast, tidal currents tend to rotate clockwise, completing one revolution per tide cycle (EG&G 1995 in ENSR 2000). Historical investigations of current velocities in Cape Cod Bay have indicated that net surface velocities range from 1.3 ft/min (0.7 cm/sec) to as much as 30.4 ft/min (15.4 cm/sec) (ENSR 2000).

Water temperature measurements have been collected by the Massachusetts Water Resources Authority (MWRA) in Boston Harbor, Massachusetts Bay, and Cape Cod Bay from 1989 through 2004. Over the 15 year period, temperatures have remained fairly consistent, ranging from approximately 2°Celsius (C) (in mid-winter) to 22°C (in mid-summer) in the near-surface water and approximately 3°C (in mid-winter) to approximately 12°C (in mid-summer) in the near-bottom water (Libby et al. 2006). Large fluctuations during the summer are typical, resulting from upwelling-downwelling fluctuations as well as short-lived wind-mixing events (Libby et al. 2006).

As reported in ENSR (2000), during 1996 at a mooring in Massachusetts Bay, the salinity at the bottom of the water column remained relatively consistent at 31-32 parts per thousand (ppt) throughout the year, while the salinity of the surface waters varied from approximately 28 ppt from late spring to early fall, to approximately 31 ppt during the remainder of the year. It is expected that salinities in the immediate nearshore vicinity of PNPS would be similar.

Dissolved oxygen (DO) concentrations in the water column of Cape Cod Bay are highest during the winter and early spring when oxygen is well mixed throughout the water column. DO measurements have been collected throughout the Massachusetts Bay/Cape Cod Bay system since 1992 by the MWRA (Libby et al. 2006). Monitoring results from this program indicate that the DO varies significantly throughout the year, with values in 2004 ranging from approximately 11 mg/L in March of 2004 to a low of approximately 7.5 mg/L in Cape Cod Bay during early fall (Libby et al. 2006). In general, the DO at the bottom is less than at the surface by 1 to 2 mg/L throughout the year (Galya et al. 1997 in ENSR 2000).

Cape Cod Bay provides habitat for numerous commercially, recreationally, or ecologically important species. The species present in western Cape Cod Bay reflect a transition between the aquatic habitats in the Gulf of Maine to the north and the Mid-Atlantic Bight to the south via

the Cape Cod canal (Lawton et al. 1995 in ENSR 2000). Cape Cod is approximately the southern boundary of the ranges of many northern Atlantic fish species and the northern boundary of the ranges of many warmer water species (ENSR 2000). Because PNPS is situated on an open part of the coast, and not within an estuary or embayment, the species in the vicinity of the station are more typical of marine than of estuarine environments (ENSR 2000).

4.0 The Plant and Cooling Water Systems

This section describes the structures and operations of PNPS.

4.1 Reactor Systems

The principal facilities present at the PNPS site include the reactor and turbine buildings, an offgas retention building, a radwaste building, a diesel generator building, an administration building, the cooling water intake structure, and the main stack. The facility operates a single reactor unit with a boiling water reactor design and turbine generator manufactured by General Electric. The facility has a licensed output of 1,998 megawatts-thermal and a current electrical rating of 715 megawatts-electric. The fuel used by the facility is low-enriched uranium dioxide with maximum enrichment of 4.6 percent by weight uranium-235 (Entergy 2006a).

4.2 Cooling and Auxiliary Water Systems

The cooling and service water systems at PNPS operate as a once-through cooling system, with Cape Cod Bay being the water source. Seawater is withdrawn from the Bay through an intake embayment formed by two breakwaters (Figure 4-1). The intake structure consists of wing walls, a skimmer wall that functions as a submerged baffle, slanted vertical bar racks that capture large debris, vertical traveling screens to prevent entrainment, fish return sluiceways, condenser cooling water pumps, and service water pumps (Figure 4-2). The two wing walls are constructed of concrete and guide flow into four separate intake bays. Each wing wall extends from the face of the intake structure at a 45 degree angle, one at a distance of 130 ft to the northwest and the other 63 ft to the northeast. The entrance of the intake measures 62 ft wide at the stop log guide, and extends to the floor of the intake structure at 24 ft below mean sea level (MSL). The skimmer wall at the front of the intake removes floating debris, with the bottom of the wall extending to 12 feet below MSL. Fish are able to escape the system by way of approximately 6 to12 10-in circular openings that are located in the skimmer walls and at each end of the intake structure. Divers have visually verified the effectiveness of the escape openings. Bar racks behind the skimmer wall intercept large debris. The racks are constructed of 3 in. by 3/8 in. rectangular bars, with a 3 in. opening between each bar. Debris and large, impinged organisms are removed from the bar racks using a mechanical rake.

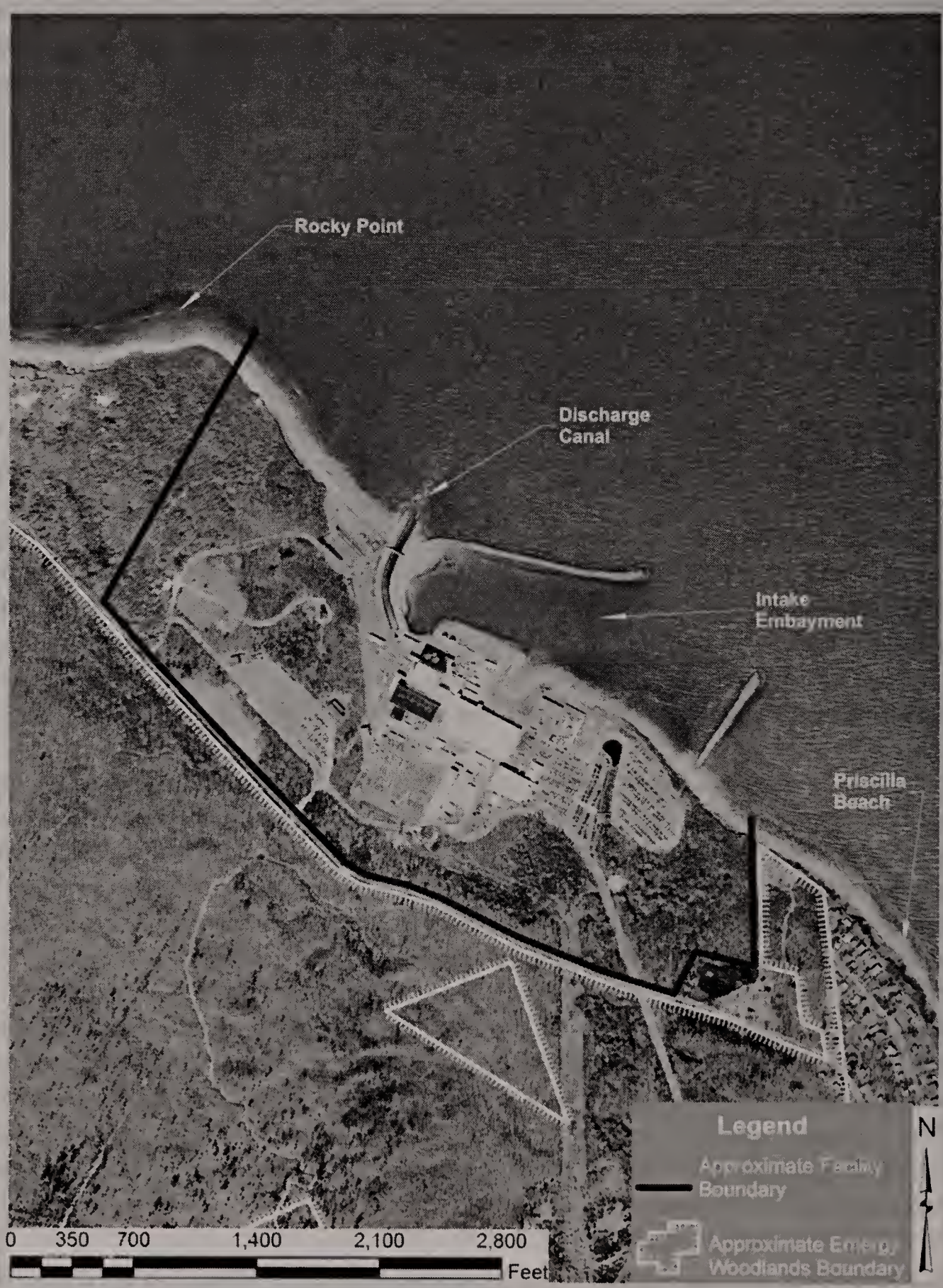

Figure 4-1. Intake System Map

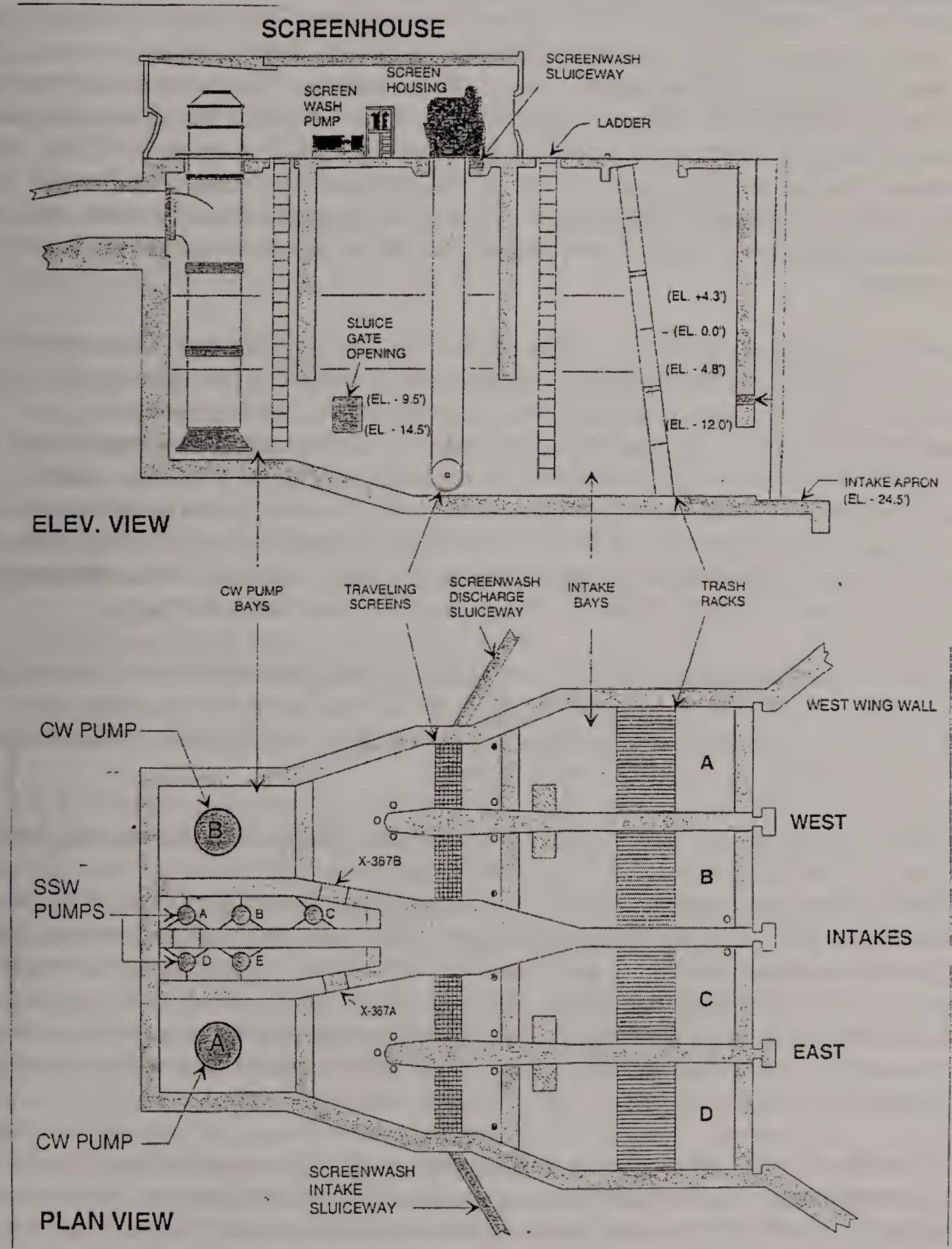

Figure 4-2. PNPS Intake Structure (Source: ENSR 2000)

Located in the seawater pump wells of the intake structure, two vertical, mixed-flow, wet-type pumps provide a continuous supply of condenser cooling water. Each 1450 horsepower (hp) pump has a capacity of 155,500 gallons per minute (gpm) (346.5 cubic feet per second [cfs]). The water is pumped from the intake structure to the condensers via two buried concrete pipes measuring 7.5 ft in diameter. Measurements taken at the breakwaters during mid-tide level with both pumps running indicate that the average intake velocity is 0.05 ft per second (fps). At the intake, before the screens, the velocity is about 1 fps during all tidal conditions. Through the traveling screens, the velocity is about 2 fps. The velocity is approximately 0.15 fps near the end of the east fish-return sluiceway, which is located in the intake embayment just east of the intake structure.

Located in the central wet well of the intake structure are five service water pumps that supply the service water system. Generally, four pumps run while one is kept on standby. Each pump has a capacity of 2500 gpm, providing a combined capacity at normal operation of approximately 10,000 gpm. The service water system is continuously chlorinated in order to control nuisance biological organisms in the service water discharge. Diffusers located downstream of the bar racks deliver a 12 percent sodium hypochlorite and seawater mixture to each intake bay. The mixture is used to ensure the total residual chlorine (TRC) discharge concentration does not exceed a maximum daily concentration of 0.10 parts per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge.

Chlorination of the main cooling water system also takes place, but not on a continuous basis. Hypochlorination events occur during spring, summer, and fall, when the circulating water system is chlorinated for up to two hours per day (one hour for each pump). A chlorine solution is added inboard of the trash rack to control fouling.

From intake to discharge, the travel time for water to move through the system varies from 5 to 10 minutes, depending upon whether one or two intake pumps are in service. The tidal stage affects pump output, also causing changes in the transit time. In addition to dye dilution studies conducted in the 1980s, the transit time has been estimated during chlorination events. During these chlorination events, chlorine is added outboard of the intake screens and monitored readings are taken in the discharge canal. Residual chlorine is typically detected approximately five minutes into the cycle. Since the chlorination events are usually conducted only when both pumps are running, it has been estimated that the transit time would be twice as fast when operating only one pump.

Prior to water flowing through either the cooling water pumps or the service water pumps, water passes through one of four 10-ft-wide traveling screens. The screens work to prevent small debris and small aquatic organisms from being entrained into the cooling water or service water systems. Each screen is constructed of 53 segments with ¼ in. by ½ in. stainless steel wire

mesh. Each segment has a stainless steel lip that is used to lift debris and organisms and direct them into the fish-return sluiceway.

The traveling screens are not operated continuously but are operated during any of the following scenarios:

- When the difference in water level on each side of the screen reaches a specified threshold at an alarm set point. The threshold is typically set at 6 in. This level difference signifies that too much debris has collected on the screen. Level differences are rare and usually the result of a storm event.

- When there is an indication that fish are being impinged at a rate exceeding 20 fish per hour, at which time the traveling screens are turned continuously until the impingement rate drops below 20 fish per hour for two consecutive sampling events. Each impingement sampling event is conducted for a minimum of 30 minutes, 3 times per week.

- During marine life monitoring. The screen wash, which occurs during screen rotations, is scheduled for eight hours prior to each of the three weekly sampling events.

- During hypo-chlorination, which occurs each day for two hours when the main cooling water system is chlorinated inboard of the trash rack to control fouling.

- Whenever water temperatures are less than 30°Fahrenheit (F).

- At a minimum, once per each 12-hour shift. This usually occurs at the beginning and end of each shift, and will usually last for a few hours.

On average, the traveling screens rotate 3 to 4 times each day. The screens normally operate at 5 fps, but can be accelerated to 20 fps during storm events which are causing extreme debris loading.

The screens are washed when they are in operation, using a dual-level spray wash. Service water is used as the source for the spray wash. Sodium thiosulfate is added to the wash water to remove chlorine and protect organisms returned to the intake embayment. The screens are washed from the side that faces the approaching flow at the splash housing, which is located about 46 ft above the bottom of the intake structure. Low pressure spray, about 20 pounds per square inch (psi), removes light fouling and organisms from the screen. Subsequently, a high pressure wash, about 100 psi, is applied to remove heavy fouling. The low and high pressure washes are about 18 to 24 in. apart. The screen rotation rate is kept slow during high impingement events.

Impinged fish are washed into a seamless concrete fish-return sluiceway and usually returned to the intake embayment approximately 300 ft east of the intake structure. The original west sluiceway was installed in 1972 and was connected to the discharge canal. In 1979, the east sluiceway was installed and connected to the intake embayment. During storms, the wash is discharged via the original sluiceway to the discharge canal. An interchangeable baffle plate is utilized to divert the flow to one sluiceway or the other from the screenhouse. The baffle plate will direct organisms and debris; however, some water will flow over this structure and into the alternate sluiceway. The new sluiceway was designed to maintain a minimum 6-in depth and a water velocity of less than 8 fps and is covered with galvanized wire screen. Though there are several turns in the sluiceway, none appear to be greater than 23 degrees. The discharge point of the east sluiceway is at the mean low water (MLW) level. On occasion, the end of the east sluiceway has been seen above the water level, causing an actual "free fall" scenario. The west sluiceway discharge is above the MLW level in the discharge canal.

Under normal operation, seawater is heated in the condensers to approximately 27 to 30°F above the intake temperature. This is within the plant's National Pollutant Discharge Elimination System (NPDES) permit, which allows for as much as a 32°F temperature change. With the cooling water flow being relatively constant at 311,040 gpm (693 cfs) throughout the year, the discharge temperature is almost entirely a function of the intake water temperature. The permitted change in temperature across the service water is 5 to 10°F. From the condensers, water flows through the buried concrete conveyances to the discharge canal. The conveyances are 235 ft of 13 ft by 17 ft reinforced concrete box culvert, followed by 250 ft of a concrete pipe that is 10.5 ft in. diameter.

Three to five times each year, the plant is reduced to 50 percent power, and a thermal backwash is conducted to control biological fouling. During the backwash, water is heated to about 105°F, and two of the four traveling screens are rotated in reverse, allowing heated, non-chlorinated seawater from the condensers to flow back over the screens and to the intake embayment. The treatment is maintained for about 35 minutes. Scheduling of the thermal backwash treatments is coordinated with the highest tide to achieve maximum coverage, preventing mussels from growing in the upper elevations of the intake structure.

Upon exiting the concrete pipe, discharged water enters a 900-foot-long trapezoidal discharge canal separated from the intake embayment by a breakwater. The discharge canal is created by two breakwaters that are oriented perpendicular to the shoreline, one of which is shared with the intake embayment. The canal sides are sloped at a 2:1 horizontal to vertical ratio. The bottom is 30 feet wide at an elevation of 0 feet MLW, or 4.8 feet below MSL. The canal bottom remains at this elevation until it converges with the shore, which has a slope of approximately 40:1 at the canal mouth. At low tide, the water in the discharge canal is several feet higher than sea level, and the discharge is rapid and turbulent (estimated at 8.1 fps). At high tide, the velocity is much lower (estimated at 1.4 fps) because the cross sectional area of flow in the

canal is greater. Discharge of the heated water creates a thermal plume in the nearshore area of PNPS. Dredging of the discharge canal has never been conducted. The intake embayment has been dredged twice, once in 1982 and again in the late 1990s. The purpose of dredging in the 1990s, though unsuccessful, was to bring colder water into the cooling water system. Each dredging event was individually permitted through the U.S. Army Corps of Engineers (USACE). The potential dredge material was tested as part of the permit, undergoing chemical, biological, and radiological analyses (see Section 2.2.5.2). The sediments were described as having relatively low concentrations of the chemical parameters tested [polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, petroleum hydrocarbons, heavy metals], and thus considered to be Category One material under the Massachusetts Department of Environmental Protection (MDEP) dredged material classification guidelines and being suitable for disposal (BSC Group 1996). Of the three potential categories of dredged material, a Category One classification has the lowest amount of contaminants. The dredged material was disposed of in open water, at the Massachusetts Bay Disposal Site, north of Boston.

5.0 Potential Effects of Plant Operation on Biota and Habitat

Operation of the PNPS cooling water system has the potential to impact marine species and habitat. Water removed from Cape Cod Bay contains a variety of aquatic organisms that may be impinged on plant intake structures or entrained through the plant in the circulating cooling water system and subjected to thermal, mechanical, chemical, and pressure stresses. In addition to being removed by the intake, the marine water column in Cape Cod Bay would experience increased temperatures near the discharge area, and organisms in the bay could be exposed to elevated water temperatures from the thermal discharge plume. Benthic invertebrates and macroalgae may also experience physical effects due to scouring of the bottom substrate by the discharge.

5.1 Impingement

Impingement may occur when aquatic organisms that are drawn into the intake with the cooling water are trapped against the screens of the intake bays. Impinged organisms may experience injury or mortality by suffocation, starvation, exhaustion, or abrasion, which can result in fatal infection. Impingement can affect fish and invertebrate species.

Impingement sampling has been conducted by PNPS since the facility first began operation and consists of monitoring three scheduled screen wash periods each week throughout the year. The screens are not continuously turned. However, in general they are turned for 8 hours prior to conducting the impingement sampling. If the screens were turned prior to sampling, a 60 minute sample is obtained. If the screens were not turned prior to arrival of the sampling crew, a 30 minute sample is scheduled (Normandeau Associates 2006b). While the screens are turning, low and high pressure sprays continuously rinse debris and organisms off the screens

into a sluiceway, which is sampled by inserting a stainless steel collection basket into the sluiceway adjacent to the traveling screens. Fish are considered to be alive if opercular movement is noted and there are no obvious signs of injury. Living fauna are noted and measured for total length and then returned to the sluiceway. Dead or injured specimens are preserved for later analysis in the lab (Normandeau Associates 2006b).

After being rinsed off of the screens and being washed into the east sluiceway, all debris and organisms are diverted via a seamless concrete sluiceway into the intake embayment, approximately 300 ft from the screens. During storm events, a portion or all of the flow from the screens is diverted to the discharge canal via the west sluiceway. A re-impingement study was attempted in the early 1980's, but due to methodological difficulties, the study was never completed.

Impingement rates are calculated by dividing the number of individuals of a given species that are collected by the number of hours in the collection period. If impingement rates of greater than 20 fish per hour are noted, additional samples are collected. If impingement rates continue to be elevated after the second sampling period, the plant operator is notified and advised to leave the screens operating until further notice (Normandeau Associates 2006b).

Since 1980, a total of 73 species of fish has been collected in the impingement sampling (Normandeau Associates 2006b). In 2005, impingement samples were collected for a total of 440 hours spread out over the entire year. Over 300,000 fish consisting of 38 species were collected (Normandeau Associates 2006b). Atlantic menhaden (*Brevoortia tyrannus*), Atlantic silverside (*Menidia menidia*), rainbow smelt (*Osmerus mordax*), winter flounder (*Pseudopleuronectus americanus*), and Atlantic tomcod (*Microgadus tomcod*) accounted for 98 percent of the annual total of impinged fish (Normandeau Associates 2006b). Atlantic menhaden were the most dominant at 97 percent, followed by Atlantic silverside (3.8 percent), rainbow smelt (1.3 percent) and winter flounder (1.2 percent) (Normandeau Associates 2006b). Approximately 23,000 invertebrates representing 18 taxa were also collected. Sevenspine bay shrimp (*Crangon septemspionosus*) was the dominant species, followed by cancer crab (*Cancer* spp.), and then American lobster (*Homarus americanus*) (Normandeau Associates 2006b).

Life stages of fish collected in the impingement sampling program may include late stage larvae, juveniles, and adults; however; the historical data provided in Normandeau Associates (2006b) do not specify the life stages collected. Therefore, discussion of the potential impacts to EFH associated with impingement are not specific to individual life stages.

Menhaden impingement rates were significantly greater in 2005 than at any other time in the history of the station being impinged at a rate 25 times greater than the historical mean. Impingement rates for silversides in 2005 were similar to the historical mean. Winter flounder and rainbow smelt were impinged at rates of almost 3 times and 2 times, respectively, of their historical means. Impingement rates for winter flounder have been steadily increasing since the

late 1990s (Normandeau Associates 2006b). There was a sharp drop in rainbow smelt impingement rates in 2000, but other than that, impingement rates have remained at relatively consistent levels since the 1990s (Normandeau Associates 2006b).

In 2005, there were 19 impingement events (greater than 20 fish per hour). In the majority of these events, menhaden and silversides were the primary species impinged (Normandeau Associates 2006b). Impingement off the Atlantic tomcod in 2005 was approximately 6 times greater than the historical mean and is the second highest impingement rate in the history of PNPS.

In 2005, survival of impinged organisms was higher during the 60 minute samples than during the 30 minute samples. This trend is consistent with previous years (Normandeau Associates 2006b). Survival of the Atlantic menhaden was low during both the 60 minute samples (27 percent) and the 30 minute samples (18 percent). The Atlantic silverside had a much greater difference in survival between the 60 minute samples and the 30 minute samples (62 percent versus 15 percent, respectively). Winter flounder survival averaged 96 percent when collected during the 60 minute samples, while survival was approximately 77 percent during the 30 minute samples. There was also a significant difference for the rainbow smelt, with 53 percent survival based on the 60 minute samples and no survival based on the 30 minute samples (Normandeau Associates 2006b). Survival for the Atlantic tomcod ranges from 35 percent for the 30 minute samples to 63 percent for the 60 minute samples.

5.2 Entrainment

Entrainment occurs when smaller objects or organisms pass through the intake screens and enter the plant's cooling system with the cooling water. Organisms entrained in the water are subjected to pressure changes, mechanical damage, toxic exposure from chlorine, and thermal stress. For the purposes of this EFH assessment, NRC staff assumes 100 percent mortality of entrained organisms.

Entrainment sampling was initiated by PNPS in 1974 and was initially conducted twice per month from January to February and from October to December and conducted weekly from March through September. During these events, sampling was conducted in triplicate. Beginning in 1994, the sampling program was modified to focus on better temporal coverage. During the January to February and October to December time periods, samples are collected every other week on three separate days for a total of approximately six samples per month. During the March through September time frame, three separate samples have been collected every week for a total of approximately 12 samples per month (Normandeau Associates 2006a). Entrainment sampling is usually conducted concurrently with the impingement sampling. Entrainment sampling is conducted by suspending a 60 cm (24 in.) diameter plankton net (with flowmeter) in the discharge canal approximately 30 m from the headwall. Typically a standard mesh of 0.333 mm (0.013 in.) is used, with the exception of the late March through late May

time period, when a 0.202 mm (0.008 in.) mesh is used to capture early stage larval winter flounder. The sampling period typically ranges from 8-30 minutes depending upon the tide; the higher tide requires a longer interval due to lower discharge stream velocities. The target is to sample a minimum quantity of 100 m^3 of water. Upon termination of the sampling period, samples are preserved in 10 percent formalin prior to laboratory identification and enumeration (Normandeau Associates 2006a).

Approximately 60 different fish species have been collected over the last 30 years of entrainment monitoring at PNPS (Normandeau Associates 2006a). In this area of Cape Cod Bay, there are three primary spawning seasons observed: winter-early spring, late spring-early summer, and late summer-autumn.

Many of the species that spawn during the winter early spring period have demersal, adhesive eggs that are not normally entrained, and as a result, more species are typically represented by larvae than by eggs during this time period (Normandeau Associates 2006a). During the 2005 winter-early spring season (generally January to April), egg collections are dominated by Atlantic cod (*Gadus morhya*), while larvae collections are dominated by the American sand lance (*Ammodytes americanus*) (Normandeau Associates 2006a). In 2004, the sand lance also dominated the larvae collections while the egg collection were dominated by American plaice (*Hippoglossoides platessoides*), followed by Atlantic cod (Marine Research, Inc. 2005b).

The late spring early summer season is typically the most active reproductive period among the temperate fishes in the PNPS area (Normandeau Associates 2006a). For entrainment sampling, in both the 2004 and 2005 late spring early summer seasons (May-July), the egg collections were dominated by tautog (*Tautogolabrus adspersus*), cunner *(Pleuronectes ferruginea*), and yellowtail founder (*Pleuronectes ferruginea*), while the larvae were dominated by winter flounder (Marine Research, Inc. 2005a; Normandeau Associates 2006a).

The late summer-early autumn season in the PNPS area typically shows a decline in overall ichthyoplankton density and number of species collected (Normandeau Associates, 2006a). The 2004 and 2005 late summer-early autumn seasons (August-December) were dominated by tautog, cunner, and yellowtail eggs, closely followed by fourspot flounder *(Paralichthyus oblongus*) and windowpane flounder (*Scopthalmus aquosus*) eggs (Marine Research, Inc. 2005b; Normandeau Associates 2006a). In 2005, the larval collections were dominated by fourbeard rockling (*Enchelyopus cimbrius*), whereas in 2004 larval collections were dominated by cunner, with the fourbeard rockling showing a much lower percentage than in 2004 (Marine Research, Inc. 2005b; Normandeau Associates 2006a).

According to Entergy (2006b), ichthyoplankton densities obtained in 2005 are consistent with the data from the 1975-2004 time series, with the exception of Atlantic cod and Atlantic mackerel eggs and larval winter flounder and rock gunnel (*Pholis gunnellus*). Both the Atlantic cod eggs and larval winter flounder abundance estimates appear to have increased over long

term trends, whereas Atlantic mackerel eggs and larval rock gunnel appear to be relatively low compared to historic data (Normandeau Associates 2006a).

Periodically through the life of the facility, there have been periods when the rate of entrainment is significantly elevated. Reporting of these "significant" events is required by the facility NPDES permit. Identification of these events was thought to be necessary so that it could be determined whether high ichthyoplankton entrainment rates were being caused by conditions in the vicinity of Rocky Point that are attributable to operation of PNPS, or whether they were attributable to naturally occurring high population levels in the bay (i.e., during spawning season) (Normandeau Associates 2006a) . These high entrainment events can contribute a significant percentage of the overall annual entrainment numbers for certain species. For example, during the 2005 sampling season, there were 54 separate high entrainment events, as defined by comparison to historical data sets. These included a total of 12 species of eggs and larvae, including American plaice, Atlantic menhaden, Atlantic herring, American sand lance, seasnail (*Liparis atlanticus*), winter flounder, radiated shanny (*Ulvaria subbifurcata*), cunner, fourbeard rockling, tautog, Atlantic mackerel, and lumped hake (Normandeau Associates 2006a).

5.3 Thermal Effects

Aquatic organisms are potentially impacted by the thermal plume associated with PNPS discharge of heated cooling water. Contact with heated discharge water may induce heat shock in animals. Alternatively, organisms that have acclimated to the thermal discharge may experience cold shock during plant shut down. The effects may occur to organisms within the water column or to bottom-dwelling organisms within the vicinity of PNPS (ENSR 2000).

Section 316(a) of the Clean Water Act (CWA) establishes a process by which a discharger can demonstrate that the established thermal discharge limitations are more stringent than necessary to protect balanced, indigenous populations of fish and wildlife and obtain facility-specific thermal discharge limits (33 USC 1326). The applicant has provided U.S. Environmental Protection Agency (EPA) with Section 316(a) demonstrations that address compliance with the thermal effluent limitations of the NPDES permit and environmental impacts of the thermal discharge. The NPDES permit (EPA 1994) states that "the thermal plumes from the station: (1) shall not deleteriously interfere with the natural movements, reproductive cycles, or migratory pathways of the indigenous populations within the water body segment; and (2) shall have minimal contact with the surrounding shorelines. To assess compliance with these requirements, there has been an extensive monitoring program of the coastal environmental near the PNPS site since the beginning of design/construction in the late 1960s (EG&G 1995).

A combined Section 316(a) and (b) demonstration report for PNPS was submitted to EPA Region 1 in 1975 and 1977 by the Boston Edison Company (Stone & Webster 1975, Stone & Webster 1977), was accepted by EPA, and was used in determining facility-specific NPDES

discharge temperature limits (Entergy 2006a). That initial Section 316 demonstration report was based on engineering, hydrological, and ecological data from a 3-year pre-operational period (1969-1972) and a 5-year post-operational period (1972-1976). It predicted that station operations would not result in long-term thermal impacts to the aquatic environment (ENSR 2000). Based on that report and ongoing ecological monitoring programs, EPA has issued and renewed NPDES permits for PNPS for over 30 years and has determined that thermal discharges from PNPS are sufficiently protective of the aquatic community of Cape Cod Bay to satisfy alternative thermal effluent limitations under Section 316(a) of the CWA (ENSR 2000, Entergy 2006a).

In recent years, EPA Region 1 has required all NPDES permittees affected by Section 316 to submit new Section 316(a) and (b) demonstrations. A new Section 316 demonstration report for PNPS was prepared in 2000 (ENSR 2000), which updated the previous report based on approximately 25 years of additional engineering, hydrological, and biological data related to PNPS operations and conditions in the aquatic environment of western Cape Cod Bay. EPA Region 1 currently is reviewing an Entergy application for renewal of the NPDES permit for PNPS, including the newest combined Section 316 demonstration report (Entergy 2006a). In the interim, Entergy has continued biological monitoring. The Thermal Discharge Fish Surveillance Program involves periodic visual inspections of the discharge canal during times of fish migration in order to determine the presence of fish and their condition.

Studies have demonstrated that the thermal plume does cause finfish to avoid the area of the plume. The plume also does not cause significant mortality, with only two individuals identified as killed as a result of heat shock in the mid 1970s. Similar studies of the thermal plume impacts on benthic organisms found no effects. Research trap catch data specifically collected to evaluate the impact on the American lobster did not identify any measurable difference in the presence of the species before or during plant operation (ENSR 2000).

An additional source of heated water discharge at PNPS is backwashing operations. Thermal backwashing is a commonly used method for control of biofouling in the condenser tubes and intake structures of power plants. Condenser tubes at PNPS are cleaned by backwashing on a 1- to 2-week interval, depending on the degree of biofouling. Because the plant electrical generation must be reduced during backwashing, the procedure usually is conducted during off-peak hours. The method involves reversing the flow of heated water so that organisms fouling the condenser tubes and intake structure are killed by the elevated temperatures. The process results in the flow of heated water out of the intake structure and into the intake embayment. The thermal backwashing process generally occurs for approximately 45 to 60 minutes and produces elevated water temperatures averaging approximately 37.8°C. A thermal survey to determine the effects of backwashing operations at PNPS found that the procedure caused a relatively thin thermal plume, averaging 3 to 5 ft (0.5 to 1.5 m) in depth, that spread rapidly from the intake structure across the western end of the intake embayment and along the

outer breakwater. The plume completely dissipated within a few hours (Normandeau Associates 1977).

6.0 Potential Effects of the Proposed Action on Designated EFH and Federally Managed Species in the Vicinity of PNPS

PNPS is located in an area that provides EFH for species managed by the New England Fishery Management Council. Also, highly migratory species managed by NMFS and their EFHs occur in the vicinity of PNPS. The NRC staff has conducted an evaluation by considering all designated EFH that could occur in the vicinity of PNPS, and used a screening process to eliminate species and their EFHs that would not be in the scope of this assessment. Because EFH is designated geographically with respect to latitude and longitude, the staff first identified the geographic boundaries of Cape Cod Bay. Table 6-1 lists the 10 minute latitude by 10 minute longitude geographic areas that were used to identify species to be included in the EFH assessment.

Table 6-2 lists the resulting species and life stages for which designated EFH potentially occurs in the vicinity of PNPS. These potentially occurring species were complied based on the species lists for the locations noted in Table 6-1. Habitat areas of particular concern (HAPCs) have not been designated for any of these species in the area surrounding PNPS.

The species on this list were further evaluated to determine if EFH was designated for the geographic area in which PNPS is located (i.e., Cape Cod Bay, Gulf of Maine), and also whether Cape Cod Bay in the vicinity of PNPS has the salinity, depth, temperature, and substrate requirements for specific life stages of an individual species. This evaluation was conducted by determining whether the EFH and general habitat parameters correlate with the physical and chemical environment surrounding PNPS. As described in Section 3, salinities in the vicinity of PNPS range from 28 to 33 ppt, while the depths in the immediate area of PNPS range from 3 to 6 m (10 to 20 ft), with a maximum depth of approximately 55 m (180 ft) at the mouth of the bay. Water temperatures in this area typically range from 2°C to 22°C at the surface and from 3°C to 12°C on the bottom, while the substrate in this area is generally sandy with the exception of two offshore rocky ledges just to the north and south of PNPS.

Table 6-1. Essential Fish Habitat Areas Associated with Cape Cod Bay

10 Minute x 10 Minute Square Coordinates				Description of Geographic Area	Source
North	**East**	**South**	**West**		
42° 10.0'N	70° 30.0'W	42° 00.0'N	70° 40.0'W	Atlantic Ocean waters within Cape Cod Bay within the square east of Duxbury, MA., Kingston, MA., and Marshfield MA., from Saquish Neck in Duxbury, MA., to Rexhame Beach in Marshfield, MA., including waters affecting most of Duxbury Bay and Powder Point in Duxbury, MA.	http://www.nero.noaa.gov/hcd/ma3.html and http://www.nero.noaa.gov/hcd/STATES4/CapecodtoNH/42007030.html://www.nero.noaa.gov/hcd/ma4.html
42° 10.0'N	70° 40.0'W	42° 00.0'N	70° 50.0'W	Atlantic Ocean waters within the square within Massachusetts Bay east of Kingston, MA., and Marshfield, MA. From Kingston Bay and Kingston to Powder Point in Duxbury, MA, along with Rexhame Beach in Marshfield, MA., to the North River Inlet in Marshfield, MA. Includes a disposal site just east of Plymouth Horn on the end of Gurnet Pt. at the tip of Duxbury Beach.	http://www.nero.noaa.gov/hcd/ma4.html and http://www.nero.noaa.gov/hcd/STATES4/CapecodtoNH/42007040.html
42° 00.0'N	70° 20.0'W	41° 50.0'N	70° 30.0'W	Atlantic Ocean waters within Cape Cod Bay within the square one square southwest of the square affecting Provincetown, MA./ tip of Cape Cod.	http://www.nero.noaa.gov/hcd/ma3.html and http:// www.nero.noaa.gov/hcd/STATES4/CapecodtoNH/ 41507020.html
42° 00.0'N	70° 30.0'W	41° 50.0'N	70° 40.0'W	Waters within Cape Cod Bay within the square affecting the following: east of Plymouth, MA., and Kingston, MA., from Plymouth Harbor south to Lookout Point in Plymouth, MA., along with the southern tip of Saquish Neck in Duxbury. Also affected by these waters are Browns Bank, Duxbury Pier, Plymouth Beach, Warren Cove, Rocky Pt., White Horse Beach and Rocks, Manomet Pt., Mary Ann Rocks, Stone Horse, Rocks, Stone Hill, Stellwagen Rocks, Center Hill Pt., and Ellisville Harbor.	http://www.nero.noaa.gov/ hcd/ma3.html and http://www.nero.noaa.gov/ hcd/STATES4/CapecodtoNH/ 41507030.html
42° 00.0'N	70° 40.0'W	41° 50.0'N	70° 50.0'W	Cape Cod Bay waters within the square affecting the following: east of Plymouth, MA., and Kingston, MA., from the Jones River past High Cliff to Plymouth Harbor Breakwall.	http://www.nero.noaa.gov/ hcd/ma4.html and http://www.nero.noaa.gov/hcd/STATES4/CapecodtoNH/41507040.html

Table 6-1. (contd)

10 Minute x 10 Minute Square Coordinates				Description of Geographic Area	Source
North	**East**	**South**	**West**		
41° 50.0'N	70° 20.0'N	41° 40.0'N	70° 30.0'W	Atlantic Ocean waters within the square within Cape Cod Bay affecting the following: north of Sandwich, MA., and Barnstable, MA. Also, these waters affect from the Cape Code Canal on the west, east to the western part of Sandy Neck, along with the Great Marshes and the western part of Barnstable Harbor. Also affected are: Town Beach, Old Harbor Creek, and Springhill Beach northeast of Sandwich, MA., Scorton Neck and Beach, Scorton Ledge, a dump site on the northwest corner, and Plowed Neck.	http://www.nero.noaa.gov/hcd/states4/capecodtoNH/41407020.html
41° 50.0'N	70° 30.0'W	41° 40.0'N	70° 40.0'W	Atlantic Ocean waters within the square within Cape Cod Bay affecting the following: the Cape Cod Canal and surrounding from Lookout Point in Plymouth, MA., southeast to the north half of Scraggy Neck, and to Great Neck and Onset, MA., except for the far end of Stony Point Dike. This square also includes waters within Buzzards Bay affecting around Bourne, MA., and the northeast part of Wareham, MA. Also affected are: Scusset Beach and Sagamore Beach.	http://www.nero. noaa.gov/hcd/ma3.html and http://www.nero.noaa.gov/hcd/STATES4/CapecodtoNH/41407030.html
Southeast Corner Boundaries				Cape Cod Bay, MA	http://www.nero.noaa.gov/hcd/ma3.html
42° 00	70° 00	41° 40	70° 10		
42° 00	70° 10	41° 40	70° 20		
42° 00	70° 20	41° 40	70° 30		
42° 00	70° 30				
41° 50	70° 00				
41° 50	70° 10				
41° 50	70° 20				
41° 50	70° 30				
41° 40	70° 00				

Table 6-2. EFH Species Potentially Occurring in the Vicinity of PNPS

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
American plaice (*Hippoglossoides platessoides*)	M	M	M	M	M
Atlantic butterfish (*Peprilus triacanthus*)	M	M	M/E	M/E	
Atlantic cod (*Gadus morhua*)	M	M	M	M	M
Atlantic halibut (*Hippoglossus hippoglossus*)	M	M	M	M	M
Atlantic mackerel (*Scomber scombrus*)	M/E	M/E	M/E	M/E	
Atlantic sea scallop (*Placopecten magellanicus*)	M	M	M	M	M
Atlantic sea herring *(Clupea harengus)*	M	M	M/E	M/E	
Black sea bass (*Centropristus striata*)	N/A		M	M	
Bluefin tuna (*Thunnus thynnus*)			M	M	
Bluefish (*Pomatomus saltatrix*)				M/E	
Haddock (*Melanogrammus aeglefinus*)	M	M			
Little skate *(Leucoraja erinacea)*			M	M	
Longfin squid (*Loligo pealei*)	N/A	N/A	M	M	
Monkfish (*Lophius americanus*)	M	M		M	
Ocean pout (*Macrozoarces americanus*)	M	M	M	M	M
Ocean quahog (*Artica islandica*)	N/A	N/A	M	M	
Pollock (*Pollachius virens*)		M	M/E	M	
Red hake (*Urophycis chuss*)	M	M	M/E	M	M
Scup (Stenotomus chrysops)	M	M	M/E	M	
Shortfin squid (*Illex illecebrosus*)	N/A	N/A	M	M	
Smooth skate (*Malacoraja senta)*			M		
Spiny dogfish (*Squalus acanthias*)	N/A	N/A	M	M	
Summer flounder (*Paralicthys dentatus*)				M	
Surf clam (*Spisula solidissima*)	N/A	N/A	M	M	
Thorny skate *(Amblyraja radiata)*			M	M	
White hake (*Urophycis tenuis*)	M	M	M/E	M/E	
Whiting/Silver hake *(Merluccius bilinearis)*	M	M	M/E	M/E	M
Windowpane flounder (*Scopthalmus aquosus*)	M/E	M/E	M/E	M/E	M/E
Winter flounder (*Pseudopleuronectes americanus*)	M/E	M/E	M/E	M/E	M/E
Winter skate *(Leucoraja ocellata)*			M	E	
Witch flounder (*Glyptocephalus cynoglossus*)	M	M			
Yellowtail flounder (*Pleuronectes ferruginea*)	M	M	M	M	M

* M = EFH in marine ecosystem; E = EFH in estuarine ecosystem.

N/A = Species either have no data available on the designated life stages, or those life stages are not present in the species reproductive cycle.

The following discussions of life stages and habitat preferences for the species listed in Table 2 include evaluations of the potential effects of continued PNPS operations on EFH. This assessment also evaluates the potential effects of continued PNPS operations on prey items of the EFH species. For the purposes of this assessment, NRC staff has classified impacts as having a minimal adverse effect, less than substantial adverse effect, or substantial adverse effect based on evaluation of entrainment, impingement, thermal effects, and effects on prey species.

American plaice (*Hippoglossoides platessoides*)

EFH for American plaice eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. For eggs and larvae, EFH includes surface waters of the Gulf of Maine and Georges Bank. This includes areas where water temperatures are below 12 to 14°C, and water depths are between 30 and 130 m (98 and 426 ft), with a wide range of salinities. EFH for juveniles, adults, and spawning adults includes bottom habitats with fine-grained, sandy, or gravel substrates in the Gulf of Maine (NMFS 2006). Water conditions in EFH for the juveniles, adults, and spawning adults includes water temperatures below 17°C, and depths between 45 and 175 m (148 and 574 ft). Spawning adults are typically found in water with temperatures below 14°C, and depths less than 90 m (295 ft) (NMFS 2005a).

Both the eggs and larvae of the American plaice are pelagic and are found in shallow surface waters, including southern New England and Cape Cod Bay (ENSR 2000). Adults are primarily benthic, but are known to migrate off of the bottom at night to prey on non-benthic species (DFO 1989 in Johnson 2004). Larvae prey on plankton, diatoms, and copepods found in surface water layers. As larvae turn into juveniles, they feed on small crustaceans, polychaetes, and cumaceans (Bigelow and Schroeder 1953 in Johnson 2004). Benthic crustaceans, mollusks, and small forage fish species make up the diet of the American plaice adults. The American plaice does not migrate substantially. Results from tagging studies have found that most recaptured individuals were found within 30 mi from the tagging site, even as long as seven years later (DFO 1989 in Johnson 2004). In 2005, an analysis of juvenile populations resulted in a proposal for the designation of HAPCs for the American plaice, including areas within Cape Cod Bay (Crawford et al. 2005). American plaice populations in the western North Atlantic have declined dramatically since the early 1980s (Johnson 2004).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH, including prey for all life stages of the American plaice. American plaice have been impinged at PNPS, but they are not a common species in the impingement sampling program (Normandeau 2006b). Eggs and larvae of the American plaice dominated entrainment studies at PNPS (ENSR 2000, Normandeau 2006a). Due to the small area affected by the thermal plume and because the American plaice would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult American plaice EFH. Continued operation of PNPS may also have the potential to affect

prey items of various life stages of the American plaice either through entrainment of phytoplankton, zooplankton, or icthyoplankton, or via impingement of small forage fish species. Continued operations of PNPS may have a substantial adverse effect on EFH for American plaice.

Atlantic butterfish (*Peprilus triacanthus*)

EFH for American butterfish eggs, larvae, juveniles, and adults exists in the vicinity of PNPS. EFH for offshore areas includes pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras. Inshore EFH for the butterfish includes the mixing or saline zones of estuaries where butterfish eggs, larvae, juveniles, and adults are common or abundant on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia (NMFS 2006). Butterfish eggs and larvae are found in water with depths ranging from the shore to 6000 ft, and temperatures between 48°F and 66°F. Juvenile and adult butterfish are found in waters from 33 to 1,200 ft deep, and with temperatures ranging from 37°F to 82°F (NMFS 2006). Spawning occurs offshore, at temperatures above 59°F (Colton 1972 in Cross et al. 1999).

All life stages, including eggs, larvae, juveniles, and adults are pelagic (Cross et al. 1999). Adult butterfish prey on small fish, squid, and crustaceans, and in turn are preyed upon by many species, including silver hake (*Merluccius bilinearis*), bluefish, swordfish (*Xiphias gladuis*), and longfinned squid (*Loligo pealei*) (ENSR 2000). In summer, the butterfish can be found over the entire continental shelf from sheltered bays and estuaries, over substrates of sand, rock, or mud, to a depth of 200 m (Cross et al. 1999). The butterfish migrates annually in response to seasonal changes in water temperature. During the summer, they migrate inshore into southern New England and Gulf of Maine waters, and in winter they migrate to the edge of the continental shelf in the Mid-Atlantic Bight (Cross et al. 1999).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, and adult Atlantic butterfish EFH. Atlantic butterfish eggs and larvae have been consistently collected in the PNPS entrainment sampling (Normandeau 2006a). They have also been collected periodically in the impingement sampling (Normandeau 2006b). However, it is unlikely that PNPS intake operations are adversely affecting butterfish as the species has not been reported to be entrained or impinged in high numbers (ENSR 2000). Due to the small area affected by the thermal plume and because the Atlantic butterfish would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult Atlantic butterfish EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the Atlantic butterfish, either through entrainment of icthyoplankton or via impingement of squid or small forage fish species. Continued PNPS operations are likely to have a less than substantial adverse effect on EFH for butterfish.

Atlantic cod (*Gadus morhua*)

EFH for Atlantic cod eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs of the species exists in surface waters around the perimeter of the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England in water depths less than 100 m (328 ft), and in temperatures below 12°C. Larval EFH for cod exists in pelagic waters of the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England in depths of 30 to 70 m (98 to 230 ft), and temperatures below 10°C. EFH for juvenile, adult, and spawning adult cod includes bottom habitats with substrates of rocks, cobble, or gravel in the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England. Juvenile cod EFH includes depths ranging from 25 to 75 m (82 to 246 ft), and water temperatures below 20°C. Adult and spawning adult EFH requirements includes water depths from 10 to 150 m (33 to 492 ft) and temperatures below 10°C (NMFS 2006). Peak spawning within Massachusetts Bay occurs in January and February (Lough 2004).

As the cod become juveniles and adults, they are able to withstand deeper, colder, and more saline water, and become more widely distributed (Fahay et al. 1999a). Some studies have shown that juveniles tend to prefer shallow areas with cobble substrates, in order to avoid predation (Gotceitas and Brown 1993 in Fahay et al. 1999a). Juveniles and younger adults tend to consume pelagic and benthic invertebrates, while adult cod also feed on both crustaceans and other fish, including sand lance, cancer crabs, and herring (*Clupea harengus*) (Lough 2004). Within the temperate part of their range, including offshore New England, cod are non-migratory and only make minor seasonal movements in response to temperature changes. At the extremes of their range, including Labrador and south of the Chesapeake, the cod migrate annually (Fahay et al. 1999a). In 2005, an analysis of juvenile populations resulted in a proposal for the designation of HAPCs for the Atlantic cod, including areas within Cape Cod Bay (Crawford et al. 2005).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH for all life stages of the Atlantic cod. Eggs and larvae of the Atlantic cod dominated entrainment studies at PNPS (ENSR 2000, Normandeau 2006a). Atlantic cod life stages have also been observed in the PNPS impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the Atlantic cod would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult Atlantic cod EFH. Continued operation of PNPS may also have the potential to affect prey items of juvenile and adult life stages of the Atlantic cod as several prey items of the Atlantic cod (sand lance and herring) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued operations of PNPS may have a substantial adverse effect on EFH for Atlantic cod.

Atlantic halibut (*Hippoglossus hippoglossus*)

EFH for Atlantic halibut eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs includes the pelagic waters and sea floor of the Gulf of Maine and Georges Bank, with water depths less than 700 m (2296 ft) and temperatures between 4 to 7°C. For larvae, the EFH consists of surface waters of the Gulf of Maine and Georges Bank. Juvenile and adult EFH for the halibut includes bottom habitats with sand, gravel, or clay substrates in the Gulf of Maine and Georges Bank. Juvenile cod are found at water depths from 20 to 60 m (66 to 197 ft) and temperatures above 2°C. Adults are found in water depths from 100 to 700 m (328 to 2296 ft) and at temperatures below 13.6°C. Spawning adult EFH consists of bottom habitats with substrates of soft mud, clay, sand, or gravel in the Gulf of Maine and Georges Bank. Spawning adults are typically found in water depths less than 700 meters, and at temperatures below 7°C (NMFS 2006). Spawning is reported to occur in late fall or spring, with peak spawning between November and December (NEFMC 1998a in ENSR 2000). However, spawning is thought to no longer occur in the Gulf of Maine (Cargnelli et al. 1999b).

The eggs of the halibut are bathypelagic, suspended within the water column at a depth of 54 to 200 m (177 to 656 ft) (Scott and Scott 1988, Blaxter et al. 1983 in Cargnelli et al. 1999b). Both the eggs and larvae are pelagic. The larvae live within surface waters until they reach juvenile stage, at which time they transform into flatfish and move to the bottom (BMLSS 1997/8 in ENSR 2000). The diet of the Atlantic halibut changes through its lifespan. Juveniles and smaller adults prey mostly on invertebrates, including annelids and crustaceans. As they grow larger, the adults prey primarily on other fish (Kohler 1967 in Cargnelli et al. 1999b). In the Gulf of Maine, the primary prey is squid, crabs, silver hake, northern sand lance (*Ammodytes dubius*), ocean pout (*Macrozoarces americanus*), and alewife (*Alosa pseudoharengus*) (Cargnelli et al. 1999b). Juveniles live within their nursery areas until the age of 3 to 4 years, and after that time perform annual migrations (Stobo et al. 1988 in Cargnelli et al. 1999b).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, adult, and spawning adult Atlantic halibut EFH. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult halibut as the species has not been reported to be entrained or impinged (Normandeau 2006a, Normandeau 2006b). Due to the small area affected by the thermal plume and because the Atlantic halibut would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult Atlantic halibut EFH. Continued operation of PNPS may also have the potential to affect prey items of juvenile and adult life stages of the Atlantic halibut as several prey items of the Atlantic halibut (squid, northern sand lance, and alewife) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for halibut.

Atlantic mackerel (*Scomber scombrus*)

EFH for Atlantic mackerel eggs, larvae, juveniles, and adults exists in the vicinity of PNPS. EFH for offshore areas includes pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras. Inshore EFH for the mackerel includes the mixing or saline zones of estuaries on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia (NMFS 2006). Mackerel eggs are found in water with depths ranging from the shore to 50 ft, and temperatures between 41°F and 73°F. Larvae of the species are found at water depths ranging from 33 to 425 ft, between temperatures of 43°F and 72°F. Juvenile and adult mackerel are found in waters from shore to 1250 ft deep, and with temperatures ranging from 37°F to 72°F (NMFS 2006). Cape Cod Bay is reported to be an important spawning area in the months from May to August (Studholme et al. 1999).

Both the eggs and larvae of the species are pelagic and transition from drifting pelagic to active swimming when they reach a size of 30 to 50 mm (1.2 to 2 in.) (Sette 1943 in Studholme et al. 1999). The adult mackerel can feed both by filter feeding and by preying on individuals. The prey consists of plankton such as amphipods, euphausiids, shrimp, crab larvae, small squid, and fish eggs (Scott and Scott 1988 in ENSR 2000). The mackerel perform annual migrations, with movement generally northeast and inshore in the spring, and offshore to deeper water in the winter (ENSR 2000). Migration is closely related to seasonal temperature changes, as the mackerel prefers to live in waters between temperatures of 6°C and 15°C (Overholtz and Anderson 1976 in Studholme et al. 1999).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH for eggs, larvae, juvenile, and adult Atlantic mackerel. Eggs and larvae of the Atlantic mackerel dominated entrainment samples at PNPS (ENSR 2000; Normandeau 2006a). Atlantic mackerel have also been observed occasionally in the PNPS impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the Atlantic mackerel would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult Atlantic mackerel EFH. Continued operation of PNPS may also have the potential to affect prey items of adult mackerel as several of its prey items (small squid and fish eggs) are commonly reported in the impingement and entrainment sampling program at PNPS. Continued operations of PNPS may have a substantial adverse effect on EFH for Atlantic mackerel.

Atlantic sea herring *(Clupea harengus)*

EFH for Atlantic sea herring eggs, larvae, juveniles, and adults exists in the vicinity of PNPS. EFH for eggs is found in bottom habitats with substrates of gravel, sand, cobbles, or shell fragments in the Gulf of Maine and Georges Bank. Eggs are typically found adhering to the bottom at water depths of 20 to 80 m (66 to 262 ft), at temperatures below 15°C, and where tidal currents result in well-mixed water. Larvae EFH includes pelagic waters of the Gulf of Maine,

Georges Bank, and southern New England that comprise 90 percent of the observed range of the species. These areas typically have water depths ranging from 50 to 90 m (164 to 295 ft), and water temperatures below 16°C. Juvenile and adult EFH exists for herring in pelagic water and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the mid-Atlantic region south to Cape Hatteras. These areas include water depths from 15 to 135 m (49 to 443 ft), and water temperatures below 10°C. EFH for spawning adults exists in bottom habitats with substrates of gravel, sand, cobble, and shell fragments in the Gulf of Maine, Georges Bank, southern New England and the mid-Atlantic region south to Delaware Bay. Spawning occurs in water depths of 20 to 80 m (66 to 262 ft), at temperatures below 15°C (NMFS 2006). Spawning occurs in high energy environments with strong tidal action (Iles and Sinclair 1982 in Stevenson and Scott 2005). In the Gulf of Maine and Georges Bank, spawning occurs from July to December (Stevenson and Scott 2005).

The Atlantic sea herring lays eggs on the bottom, in gravel, rock, or shell substrates. The eggs adhere to the bottom in layers and form beds (Bigelow and Schroeder 1953, Mansueti and Hardy 1967 in ENSR 2000). As juveniles, Atlantic herring form large aggregations in coastal areas. Both the larvae and juveniles feed on zooplankton, including copepods (ENSR 2000). The Atlantic herring of all life stages is preyed upon by other fishes, including cod, pollock (*Pollachuis virens*), haddock (*Melanogrammus aeglefinus*), silver hake, mackerel, dogfish, fin whales (*Balaenoptera physalus*), and squid (Hildenbrand 1963, Bigelow and Schroeder 1953 in ENSR 2000), as well as other marine mammals and birds. Adult Atlantic herring feed on zooplankton and capture prey by direct, predatory snapping action (Blaxter and Holliday 1963 in ENSR 2000). There is an annual migration of adult Atlantic herring from summer feeding areas along the Maine coast to southern New England (Stevenson and Scott 2005).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH for eggs, larvae, juvenile, and adult Atlantic sea herring. Larvae of the Atlantic sea herring dominated entrainment samples at PNPS (ENSR 2000, Normandeau 2006a). Atlantic sea herring have not been observed in the impingement sampling program at PNPS (Normandeau 2006b). Due to the small area affected by the thermal plume and because the Atlantic sea herring would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult Atlantic sea herring EFH. Continued operation of PNPS may also have the potential to affect prey items of larval, juvenile, and adult stages of the Atlantic sea herring as it is a filter feeder on plankton and entrainment by the plant removes plankton from the local environment. Continued operations of PNPS are likely to have a less than substantial adverse effect on EFH for the Atlantic sea herring.

Atlantic sea scallop (*Placopecten magellanicus*)

EFH for Atlantic sea scallop eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs includes bottom habitats in the Gulf of Maine, Georges Bank,

and southern New England, with water temperatures below 17°C. Larvae EFH includes pelagic waters and bottom habitats, in areas with substrates of gravelly sand, shell fragments, and pebbles in the Gulf of Maine, Georges Bank, and south to North Carolina. EFH for juveniles, adults, and spawning adults includes bottom habitats with cobble, shell, or sand in the Gulf of Maine, Georges Bank, and south to North Carolina. Juveniles, adults, and spawning adults are found at water depths from 18 to 110 m (59 to 361 ft), with temperatures generally below 21°C (NMFS 2006). Spawning peaks between May and June in the mid Atlantic and in September and October in Georges Bank, usually in water with temperatures below 16°C (NEFMC 1998a).

Eggs are not buoyant and remain on the substrate until hatching into free-swimming larvae (NEFMC 1998a). Larvae occupy pelagic waters and bottom habitats of gravel, shell litter, algae, or sedentary benthic infauna (NEFMC 1998a). North of Cape Cod, the sea scallop is generally found at depths of less than 20 m (65 ft) on hard substrates of cobble, shell litter, or coarse gravel/sand (NEFMC 1998a, Lai and Rago 1998 in ENSR 2000). Sea scallops are suspension filter feeders and their diet typically consists of phytoplankton and microzooplankton (Hart and Chute 2004).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, adult, and spawning adult Atlantic sea scallop EFH. It is unlikely that PNPS intake operations are adversely affecting eggs or larval sea scallops as the species has not been reported to be entrained or impinged (ENSR 2000, Normandeau 2006a, Normandeau 2006b). The thermal discharge is unlikely to affect sea scallop juveniles and adults because the affected area makes up a tiny portion of their EFH. Continued operation of PNPS may also have the potential to affect prey items of the Atlantic sea scallop as it is a filter feeder on plankton and entrainment by the plant removes plankton from the local environment. Continued PNPS operations are likely to have a minimal adverse effect on EFH for sea scallop.

Black sea bass (*Centropristus striata*)

EFH for juvenile and adult black sea bass exists in the vicinity of PNPS. Offshore EFH for both juveniles and adults includes demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras. For inshore areas, EFH is found in estuaries where black sea bass are found to be common or abundant in the Estuarine Living Marine Resource (ELMR) database for the mixing and seawater salinity zones. Both juveniles and adults prefer warm water (greater than 43°F), in areas where the bottom substrate includes rough bottom, shellfish, eelgrass beds, or man-made or natural structured habitats (NMFS 2006, Jury et al. 1994). Spawning occurs on the inner continental shelf, at water depths of 20 to 50 m (66 to 164 ft), between the Chesapeake Bay and Long Island (Steimle et al. 1999d). Larvae have been reported in Cape Cod Bay, but these are interpreted to have been spawned in Buzzards Bay and moved through the Cape Cod Canal (MAFMC 1996b in Steimle et al. 1999d). Spawning in Massachusetts coastal waters occurs on sandy bottoms broken by rocky ledges (Kolek 1990, MAFMC 1996b in Steimle et al. 1999d).

Eggs and larvae of the black sea bass are pelagic and are found in spawning areas on the continental shelf (Steimle 1999d). As juveniles, the species moves inshore, where they form nurseries in estuaries (et al. Able and Fahay 1998 in Steimle et al. 1999d). Juveniles mature as females, and then change to males as they grow larger (Lavenda 1949 in Steimle et al. 1999d). Larval black sea bass probably prey on zooplankton (Steimle et al. 1999d). The juveniles are visual predators that feed on benthic crustaceans and small fish (Richards 1963, Allen et al. 1978, Werme 1981 in Steimle et al. 1999d). The species is primarily a warm-water fish and begins to migrate offshore to depths of 30 to 240 m (98 to 787 ft) as bottom-water temperatures reach 7°C (Steimle et al. 1999d).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult black sea bass EFH. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult black sea bass as the species has not been reported to be commonly entrained or impinged (ENSR 2000, Normandeau 2006a, Normandeau 2006b). Due to the small area affected by the thermal plume and because the black sea bass would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult black sea bass EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the black sea bass, either through entrainment of zooplankton or icthyoplankton, or via impingement of small forage fish species. Continued PNPS operations are likely to have a minimal adverse effect on EFH for black sea bass.

Bluefin tuna (*Thunnus thynnus*)

EFH for juvenile and adult bluefin tuna exists in the vicinity of PNPS. For juveniles, EFH includes the inshore and pelagic waters warmer than 12°C in the Gulf of Maine and Cape Cod Bay, and south to Florida. Adult EFH includes pelagic waters from the Gulf of Maine south to Texas, at water depths greater than 50 m (164 ft) (NMFS 2006). Spawning for the bluefin tuna occurs from mid-April to June in the Gulf of Mexico and Florida Straits (NMFS 2005c).

The prey of the bluefin tuna includes mackerel, herring, whiting (*Merlussius bilinearis*), and squid (Buck 1995). The species is endothermic, meaning it generates heat internally, which allows it to dive to deeper and colder waters in search of prey (NMFS 1999). The tuna can live in water ranging from 7°C to 30°C (NMFS 1999). The bluefin tuna migrates extensively. Following spawning in the Gulf of Mexico area in spring and early summer, the species migrates north along the U.S. coast to waters off of Canada (Buck 1995).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult bluefin tuna EFH. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult bluefin tuna as the species has not been reported to be entrained or impinged (ENSR 2000, Normandeau 2006a, Normandeau 2006b). Due to the small area affected by the thermal plume and because the bluefin tuna would exhibit behavioral avoidance if water temperatures

are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult bluefin tuna EFH. Continued operation of PNPS may also have the potential to affect prey items of juvenile or adult life stages of the bluefin tuna as several prey items of the bluefin tuna (mackerel, herring, whiting, and squid) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for bluefin tuna.

Bluefish (*Pomatomus saltatrix*)

EFH for adult bluefish exists in the vicinity of PNPS (EFH for eggs, larvae, and juveniles does not occur as far north as Cape Cod Bay) (NMFS 2006). EFH for adults includes all major estuaries from Penobscot Bay, Maine to St. Johns River, Florida; also, north of Cape Hatteras EFH for adults includes continental shelf waters north to Cape Cod Bay. Adult bluefish are typically in North Atlantic estuaries from June to October. EFH requirements for adult bluefish include saline, pelagic waters with temperatures between 14 °C and 16 °C.

Bluefish is a migratory, pelagic species found in temperate coastal zones throughout the world and are very common along along the east coast of the U.S. (Shepherd 2000b). Within the western Atlantic, bluefish are found from Maine to Florida, migrating northward in the spring and southward in the fall (ENSR 2000). Bluefish migrate in response to temperature changes in order to remain in water with temperatures above 14 to 16 °C (Bigelow and Schroeder 1953 in Shepherd and Packer 2006). They live in southern New England waters in spring and summer, and migrate to waters off the southeastern U.S. in autumn (Shepherd and Packer 2006). Bluefish reach sexual maturity at the age of two years (Deuel 1964, in Shepherd and Packer 2006; ENSR 2000). Spawning occurs in the area from New York south to Florida (Shepherd and Packer 2006). Bluefish eggs and larvae are buoyant and live within surface waters, only within open oceanic waters (Able and Fahay 1998 in Shepherd and Packer 2006). The larvae feed on surface plankton until they reach juvenile stage, and then migrate to coastal nursery areas to feed on other fish species (Kendall and Watford 1979, in ENSR 2000; Sheperd and Packer 2006). Adult bluefish are voracious predators, and prey on squid, shrimp, crabs, alewives, menhaden, silver hake, butterfish and smaller bluefish (ENSR 2000).

The intake and discharge at PNPS have the potential to adversely affect EFH for adult bluefish. Bluefish juveniles and adults are reported to have been observed in the vicinity of PNPS (ENSR 2000). No life stages of the bluefish have ever been observed in the PNPS entrainment sampling. Juveniles and/or adults have been observed in the PNPS impingement sampling program. Due to the small area affected by the thermal plume and because the bluefish would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect adult bluefish EFH. Some prey species are entrained and impinged at PNPS; however, because adult bluefish opportunistically feed on many invertebrate and vertebrate species, the effect of reduced prey availability is expected to

be negligible. Continued PNPS operations are likely to have a minimal adverse effect on EFH for bluefish.

Haddock (*Melanogrammus aeglefinus*)

EFH for haddock eggs and larvae exists in the vicinity of PNPS. EFH for eggs of the species is found in coastal areas of the Gulf of Maine in water with temperatures below 10°C and depths from 50 to 90 m (164 to 295 ft). Larval EFH includes surface waters from Georges Bank south to Delaware Bay, in water with temperatures below 14°C and depths ranging from 35 to 100 m (115 to 328 ft) (NMFS 2006). Spawning varies by location and time of year, with spawning generally occurring from February to May in the Gulf of Maine. The largest spawning area in U.S waters is Georges Bank, and for the Gulf of Maine stock, spawning occurs at the Jeffrey's Ledge and Stellwagen Bank areas (Brodziak 2005 in Cargnelli et al. 1999e).

Eggs, larvae, and juveniles all live within the upper part of the water column until the juveniles reach a size of 3 to 10 cm (1.2 to 3.9 in.) (Brodziak 2005 in Cargnelli et al. 1999e). At that time, juveniles travel to the bottom, identify suitable habitat, and become demersal (Klein-MacPhee 2002 in Cargnelli et al. 1999e). The diet of haddock changes through their life cycle. Larvae and small juveniles feed on phytoplankton, copepods, and invertebrate eggs suspended in the water column. Once juveniles move to the bottom, they primarily eat small crustaceans, polychaetes, and small fish. As adults, haddock feed primarily on benthic organisms such as echinoderms, crustaceans, polychaetes, and mollusks (Brodziak 2005 in Cargnelli et al. 1999e). There are data that suggest larvae drift with currents from Canadian waters as far south as Cape Cod, and then live a portion of their lives in this area (Colton and Temple 1961 in Cargnelli et al. 1999e). Haddock are not migratory, with only minor movements shoreward in summer and to deeper water in winter (Brodziak 2005 in Cargnelli et al. 1999e).

The PNPS intake and discharge have the potential to adversely affect egg and larval haddock EFH. However, it is unlikely that PNPS intake operations are adversely affecting haddock as eggs and larvae are not common in entrainment sampling program (Normandeau 2006a). None of the haddock life stages have been observed in the PNPS impingement monitoring program (Normandeau 2006b). Continued operation of PNPS may also have the potential to affect prey items of various life stages of the haddock, either through entrainment of plankton, or via impingement of small forage fish species. Continued PNPS operations are likely to have a minimal adverse effect on EFH for haddock.

Little skate (*Leucoraja erinacea)*

EFH for little skate juveniles and adults exists in the vicinity of PNPS. In the 2003 FMP for the Northeast Skate Complex (NEFMC 2003), EFH was designated for the little skate. This designation included bottom habitats with substrates of sand, gravel, and mud in Cape Cod Bay for both juveniles and adults (NEFMC 2003). Little skate have a reported depth range of 0 to

137 m (449 ft), with most being found less than about 100 m (328 ft) deep (Bigelow and Schroeder 1953,; McEachran and Musick 1975 in Packer et al. 2003b). The corresponding water temperature ranges from 1 to 21°C (Bigelow and Schroeder 1953; Tyler 1971; McEachran and Musick 1975 in Packer et al. 2003b). Little skates typically prefer sandy or gravelly substrates (Bigelow and Schroeder 1953 in Packer et al. 2003b) and are known to bury themselves in depressions during the day (Michalopoulos 1990 in Packer et al. 2003b).

Eggs of all skates are encapsulated in a leathery capsule that rests on the bottom (Sosebee 2000; Packer et al. 2003b). The eggs hatch fully developed, so there is no larval stage (Sosebee 2000; McEachran 2002 in Packer et al. 2003b). Adults are estimated to reach sexual maturity at the age of 4 years (Packer et al. 2003b). Spawning may occur at any time during the year, with a peak in southern New England from July to September (Bigelow and Schroeder 1953 in Packer et al. 2003b). The major prey reported for the little skate in the Gulf of Maine area includes decapod crustaceans, amphipods, and polychaetes (McEachran 1973; McEachran et al. 1976 in Packer et al. 2003b). Skates do not migrate substantially but do generally move offshore in summer and early autumn and onshore during winter and spring (Sosebee 2000). Bottom trawl surveys found juvenile little skates in heavy concentrations nearshore in Cape Cod Bay in the spring (Packer et al. 2003b). Adults were also found in Cape Cod Bay during the spring, summer, and fall (Packer et al. 2003b).

The PNPS intake and discharge have the potential to adversely affect EFH for the little skate. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult little skate as the species has not been reported to be entrained (Normandeau 2006a). The little skate has been observed in the impingement sampling program at PNPS; however, it is not common (Normandeau 2006b). Due to the small area affected by the thermal plume and because the little skate would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult little skate EFH. It is unlikely that continued operation of PNPS would have an impact on prey items of the little skate, as its diet consists primarily of benthic invertebrates. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the little skate.

Longfin squid (*Loligo pealei*)

EFH for longfin squid juveniles and adults exists in the vicinity of PNPS. EFH for both juveniles and adults includes pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras. Both juveniles and adults are typically found in water with temperatures ranging from 39°F to 81°F, and in water depths ranging from the shore to 700 ft (for juveniles) and shore to 1000 ft (for adults) (NMFS 2006). The species is known to spawn year-round, which can vary geographically (Brodziak et al. 1996, and Hatfield et al. 2002 in Jacobson 2005).

Food habits of longfin squid depend on size: small individuals consume planktonic organisms (Vovk 1972, Tibbetts 1977 in Cargnelli et al. 1999a), whereas larger individuals consume

crustaceans and small fish (Vinogradov and Noskov 1979 in Cargnelli et al. 1999a). Seasonal and inshore/offshore variances in the diets of longfin squid were demonstrated by Maurer and Bowman (1985 in Cargnelli et al. 1999a). Longfin squid are typically observed in waters with temperatures of at least 9°C (Lange and Sissenwine 1980 in Cargnelli et al. 1999a). During late autumn to winter, longfin squid migrate to warmer waters along the edge of the continental shelf (Cadrin 2000 in ENSR 2000). During the spring and early summer, the species moves inshore to spawn (Cadrin 2000 in ENSR 2000).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH for juvenile and adult longfin squid. The longfin squid is reported to be one of the most commonly impinged species identified in impingement studies at PNPS (ENSR 2000). It has not been observed in the entrainment sampling at PNPS (Normandeau 2006a). Due to the small area affected by the thermal plume and because the longfin squid would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult longfin squid EFH. Continued operation of PNPS may also have the potential to affect prey items of juvenile or adult longfin squid, either through entrainment of plankton, or via impingement of small forage fish species. Continued operations of PNPS are likely to have a less than substantial adverse effect on EFH for the longfin squid.

Monkfish (*Lophius americanus*)

EFH for eggs, larval, and adult monkfish exists in the vicinity of PNPS. EFH for monkfish eggs includes surface waters of the Gulf of Maine, Georges Bank, and southern New England to North Carolina. The eggs are mostly found in water depths ranging from 15 to 1000 m (49 to 3281 ft), and at temperatures below 18°C. Larval EFH exists in pelagic waters of the Gulf of Maine, Georges Bank, and southern New England to North Carolina. This includes areas where water temperatures are below 18°C and water depth ranges from 25 to 1000 m (82 to 3281 ft). Adult monkfish EFH is found in bottom habitats with substrates of sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud in the Gulf of Maine, Georges Bank, and southern New England to the mid-Atlantic. Adult monkfish typically live in water depths from 25 to 200 m (82 to 656 ft), and at temperatures below 15°C (NMFS 2006).

Spawning occurs in locations including inshore shoals and offshore surface water, in temperatures below 18°C, in the months from May to June within the Gulf of Maine (Scott and Scott 1988, Hartley 1995 in Steimle et al. 1999b). Eggs are buoyant and are laid in rafts that may be up to 6 to 12 m (20 to 39 ft) long (Steimle et al. 1999b). Larvae and juveniles are also pelagic and eventually descend to the bottom to live their adult lifespan as benthic fish (NOAA 1998a in ENSR 2000). Once they have settled to the bottom, juveniles prefer a substrate of sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud, with water temperatures below 15°C (NEFMC 1998a in ENSR 2000). Adults spend most of their lives resting on the bottom in depressions within sandy sediment (Steimle et al. 1999b). The larvae feed on

zooplankton, including copepods and crustacean larvae, while juveniles eat smaller fish, including sand lance, and shrimp and squid (Bigelow and Schroeder 1953 in Steimle et al. 1999b). Adults eat a variety of benthic and pelagic species, sea birds, and even younger monkfish, and they capture prey with an ambush or sudden rush (Steimle et al. 1999b). The monkfish has annual migrations in response to spawning preference and food availability.

The PNPS intake and discharge have the potential to adversely affect egg, larvae, and adult monkfish EFH. Monkfish eggs and larvae have been consistently collected in the PNPS entrainment sampling program (Normandeau 2006a). They are only infrequently collected as part of the PNPS impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the monkfish would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect adult monkfish EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the monkfish, as several prey items of the monkfish (zooplankton, sand lance, and squid) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a less than substantial adverse effect on EFH for the monkfish.

Ocean pout (*Macrozoarces americanus*)

EFH for ocean pout eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs, larvae, juveniles, and adults includes bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the mid-Atlantic region south to Delaware Bay. Eggs and larvae are typically found at water depths less than 50 m (164 ft), and at temperatures below 10°C. EFH for juveniles and adults includes water depths up to 110 m (361 ft) and temperatures below 15°C (NMFS 2006). Spawning adult EFH consists of areas with hard bottom substrates, including artificial reefs or shipwrecks, in the Gulf of Maine, Georges Bank, southern New England, and the mid-Atlantic region south to Delaware Bay. Spawning usually occurs in water less than 50 m (164 ft) deep and at temperatures below 10°C.
The species lays eggs in nests, which it then guards until they hatch (Steimle et al. 1999c). Both the larvae and adults are demersal and are not known to form schools (Steimle et al. 1999c). There are differing reports on how the ocean pout feeds. According to a report by MacDonald (1983 in Steimle et al. 1999c), ocean pout feed by sorting through mouthfuls of sediment for fauna contained within the sediment and do not appear to visually follow prey or leave the bottom to feed. However, Auster (1985 in Steimle et al. 1999c) reported that ocean pout hide within sediment depressions to wait for prey to swim or drift by. The prey is reported to consist of echinoderms, crustaceans, and other benthic invertebrates (Anderson 1994 in ENSR 2000). The ocean pout does not migrate, although it moves seasonally within a limited region (Bigelow and Schroeder 1953 in Steimle et al. 1999c). Juvenile ocean pout were reported to be commonly found in saline water (greater than 25 ppt) in many estuaries and coastal areas, including Cape Cod Bay, throughout the year (Jury et al. 1994 in Steimle et al. 1999c).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, adult, and spawning adult ocean pout EFH. It is unlikely that PNPS intake operations are adversely affecting ocean pout as the species has not been reported to be entrained (Normandeau 2006a). It has only been infrequently observed in the impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the ocean pout would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult ocean pout EFH. It is unlikely that continued operation of PNPS would have a impact on prey items of the ocean pout, as its diet consists primarily of benthic invertebrates. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the ocean pout.

Ocean quahog (*Artica islandica*)

EFH for ocean quahog juveniles and adults exists in the vicinity of PNPS. EFH for both juveniles and adults includes the substrate to a depth of 3 ft below the sediment/water interface from the eastern edge of the Georges Bank and Gulf of Maine throughout the Atlantic exclusive economic zone (EEZ). Both juveniles and adults are typically found in water with temperatures below 60°F, and in water depths ranging from 30 to 800 feet (NMFS 2006). In the Gulf of Maine region, they are found in relatively nearshore waters (Weinberg 2001).

Similar to surf clams, ocean quahogs are planktivorous siphon feeders and are preyed upon by moon snails, boring snails, and predatory fish such as haddock and cod (Cargnelli et al. 1999d). Estimates for attaining sexual maturity have ranged from 9 to 13 years (Cargnelli et al. 1999d).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult ocean quahog EFH. However, it is unlikely that PNPS intake operations are adversely affecting eggs or larval ocean quahog as the species has not been reported to be entrained or impinged (ENSR 2000, Normandeau 2006a, Normandeau 2006b). The thermal discharge is unlikely to affect ocean quahog juveniles and adults because the affected area makes up a tiny portion of their EFH. Due to the small area affected by the thermal plume and because the ocean quahog would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult ocean quahog EFH. Continued operation of PNPS may also have the potential to affect prey items of the ocean quahog as it is a filter feeder on plankton and entrainment by the plant removes plankton from the local environment.

Continued PNPS operations are likely to have a minimal adverse effect on EFH for the ocean quahog.

Pollock (*Pollachius virens*)

EFH for pollock larvae, juveniles, and adults exists in the vicinity of PNPS. EFH for eggs and larval pollock includes pelagic waters of the Gulf of Maine and Georges Bank in water depths from 10 to 270 m (33 to 886 ft) and at water temperatures below 17°C. Juvenile, adult, and spawning adult EFH consists of bottom habitats with hard substrates, including artificial reefs, sand, mud, or rocks in the Gulf of Maine and Georges Bank. Juvenile pollock are found at water depths from 0 to 250 m (820 ft) and at temperatures below 18°C. Adult and spawning adult pollock are found at water depths ranging from 15 to 365 m (49 to 1197 ft), and temperatures below 14°C (adults) and 8°C (spawning adults) (NMFS 2006). The western Gulf of Maine, including Massachusetts Bay, is one of the principal spawning sites for pollock (Cargnelli et al. 1999g). Spawning in the Gulf of Maine occurs from November to February (Steele 1963, Colton and Marak 1969 in Cargnelli et al. 1999e), at water temperatures from 4.5°C to 6°C (Cargnelli et al. 1999g). Eggs are spawned on hard substrates in water depths between 10 and 365 m (33 to 1197 ft) (NEFMC 1998a in ENSR 2000).

Pollock eggs and larvae are pelagic until the larvae reach an age of about 3 to 4 months. At that time, the small juveniles migrate inshore and inhabit rocky subtidal and intertidal zones. At the end of their second year, the juveniles move offshore, where they remain through their adult life (Cargnelli et al. 1999g). Larvae living in near-surface waters feed on larval copepods (Steele 1963 in Cargnelli et al. 1999g), while juvenile pollock feed on crustaceans (Cargnelli et al. 1999g) and fish, including young Atlantic herring (Ojeda and Dearborn 1991 in Cargnelli et al. 1999g). The primary food source for adults is euphausiids (*Meganyctiphanes norvegica*) and Atlantic herring (Cargnelli et al. 1999g). Pollock is a schooling species, but do not have substantial migration, expect for small movements related to temperature change (Hardy 1978 in Cargnelli et al. 1999g).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult pollock EFH. However, it is unlikely that PNPS intake operations are adversely affecting pollock as eggs and larvae are only periodically entrained (Normandeau 2006a) and other life stages have also not been commonly reported in the impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the pollock would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult pollock EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the pollock, as several prey items of the pollock (zooplankton and herring) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the pollock.

Red hake (*Urophycis chuss*)

EFH for red hake eggs, larvae, juveniles, and adults exists in the vicinity of PNPS. EFH for eggs and larval red hake includes surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the mid-Atlantic region south to Cape Hatteras. Red hake eggs are found in water at temperatures below 10°C. Larvae are found at water depths less than 200 m (656 ft) and at temperatures below 19°C. Juveniles, adults, and spawning adults are all found in bottom habitats, with juveniles preferring substrates of shell fragments and live scallops, and adults and spawning adults being found near substrates of sand and mud. The juveniles, adults, and spawning adults are all typically found in waters less than 100 m (328 ft) deep and in water temperatures below about 16°C (NMFS 2006). Spawning occurs in water at temperatures of 5°C to 10°C (Steimle et al. 1999a), within depressions in muddy or sandy substrates (NEFMC 1998a in ENSR 2000). The primary spawning grounds include the southern edge of Georges Bank and shallow areas off of the southern New England coast (Sosebee 1998 in ENSR 2000).

Both the eggs and larvae of the red hake are pelagic, occurring in surface waters less than 10°C (eggs) and 19°C (larvae) (NEFMC 1998a in ENSR 2000). Shelter is an important habitat requirement for red hake (Steiner et al. 1982 in Steimle et al. 1999a). When the fish become juveniles, they migrate to shallower waters along the coast and live among shell litter or live scallop beds (Cohen et al. 1990, NEFMC 1998a in ENSR 2000). Adult red hake typically live in areas with soft sediment bottoms and, less commonly, near gravel or rock bottoms (Steimle et al. 1999a). Larvae feed mainly on copepods and other micro-crustaceans (Steimle et al. 1999a). Juvenile red hake feed primarily on crustaceans such as amphipods and shrimp. The adults feed on amphipods and shrimp, as well as squid, herring, various flatfish species, and mackerel (Cohen et al. 1990 in ENSR 2000). Red hake migrate extensively due to seasonal and temperature variations. During winter, they live offshore in water greater than 100 m (328 ft) deep, but in summer, red hake migrate into shallow coastal water and estuaries of the Gulf of Maine, and live in water less than 10 m (33 ft) deep (Steimle et al. 1999a).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, adult, and spawning adult red hake EFH. Eggs and larvae have been consistently observed in the PNPS entrainment sampling program (Normandeau 2006a). Red hake have also been commonly observed in the PNPS impingement sampling program (Normandeau 206b). However the area affected by the intake system is small and, thus, impacts to red hake EFH are not expected. Due to the small area affected by the thermal plume and because the red hake would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult red hake EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the red hake, as several prey items of the red hake (zooplankton, squid, herring, flatfish species, and mackerel) have been commonly reported in the impingement and entrainment sampling

program at PNPS. Continued PNPS operations may have a substantial adverse effect on EFH for the red hake.

Scup (*Stenotomus chrysops*)

EFH for scup eggs, larvae, juvenile, and adults exists in the vicinity of PNPS. For eggs and larvae, EFH includes estuaries where scup were identified as common or abundant in the ELMR database for the mixing and seawater salinity zones (NMFS 2006, Jury et al. 1994). EFH for juveniles and adults in offshore areas includes demersal waters over the Continental Shelf from the Gulf of Maine to Cape Hatteras. EFH for juveniles and adults in inshore areas includes estuaries where scup are identified as being common or abundant in the ELMR database for the mixing and seawater salinity zones (NMFS 2006, Jury et al. 1994). Both juvenile and adult scup EFH occurs in waters where temperatures are greater than 45°F (NMFS 2006). Southern New England, including Massachusetts Bay, is considered to be a primary spawning area for scup (Steimle et al. 1999f). Scup spawn in shallow shoal waters less than 10 m (33 ft) deep until late June, and then move to deeper water (MAFMC 1996a in Steimle et al. 1999f).

Both eggs and larvae are pelagic, and the larvae become demersal in shoal areas in early July (Able and Fahay 1998 in Steimle et al. 1999f). The adults can occupy a variety of benthic habitats, from open water to structured areas (Steimle et al. 1999f). Both juvenile and adult scup are benthic feeders. Adults eat small crustaceans, polychaetes, mollusks, small squid, vegetable detritus, insect larvae, sand dollars, and small fish (Bigelow and Schroeder 1953, Morse 1978, Sedberry 1983 in Steimle et al. 1999f). Smaller scup are frequently found in bays and estuaries, but larger adult scup usually live in deeper water ranging from 70 to 180 m (230 to 590 ft) (Steimle et al. 1999f). Larval scup were reported in Cape Cod Bay in May through September, in water with temperatures of 14°C to 22°C (MAFMC 1996a in Steimle et al. 1999f).

The PNPS intake and discharge have potential to adversely affect egg, larvae, juvenile, and adult scup EFH. However, it is unlikely that PNPS intake operations are adversely affecting scup as eggs and larvae have only been infrequently observed in the entrainment sampling program (Normandeau 2006a) and are not common in the impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the scup would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult scup EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the scup, as several prey items of the scup (squid and small fish species) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the scup.

Shortfin squid (*Illex illecebrosus*)

EFH for shortfin squid juveniles and adults exists in the vicinity of PNPS. EFH for both juveniles and adults includes pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras. Both juveniles and adults are typically found in water with temperatures ranging from 39°F to 73°F, and at water depths ranging from the shore to 600 ft (NMFS 2006).

The shortfin squid is highly migratory and is found primarily in the offshore waters of the continental shelf and slope from Florida to Labrador (Hendrickson 2000 in ENSR 2000). Individuals experience an extensive spawning migration to warmer waters south of Cape Hatteras during the autumn (Hendrickson 2000 in ENSR 2000). Peak spawning occurs during the winter, and larvae and juveniles are conveyed northward in the warm waters of the Gulf Stream (Hendrickson 2000 in ENSR 2000). The squid that spawned throughout the winter will migrate during late spring onto the continental shelf (Hendrickson 2000 in ENSR 2000). The diet of the shortfin squid typically consists of fish and crustaceans (Squires 1957; Froerman 1984, Mauer and Bowman 1985; Dawe 1988 in Cargnelli et al. 1999a).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult shortfin squid EFH. It is unlikely that PNPS intake operations are adversely affecting juvenile and adult shortfin squid as the species has not been entrained or impinged at PNPS (Normandeau 2006a; Normandeau 2006b). Due to the small area affected by the thermal plume and because the shortfin squid would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult shortfin squid EFH. Continued operation of PNPS may also have the potential to affect prey items of various life stages of the shortfin squid, as one of their prey items (small fish species) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the shortfin squid.

Smooth skate (*Malacoraja senta)*

EFH for smooth skate juveniles exists in the vicinity of PNPS. In the 2003 FMP for the Northeast Skate Complex (NEFMC 2003), EFH was designated for the smooth skate. This designation included bottom habitats with substrates of sand, gravel, broken shell, pebbles, and soft mud in the Gulf of Maine, including portions of Cape Cod Bay, for juveniles (NEFMC 2003). The water depth range for the smooth skate is from 31 to 874 m (102 to 2867 ft), with most being found from 110 to 457 m (361 to 1499 ft) (McEachran and Musick 1975, McEachran 2002 in Packer et al. 2003d). The temperature range of the species is from 2°C to 13°C for juveniles and adults, with most found between temperatures of 4°C to 8°C (Packer et al. 2003d). The smooth skate is found mostly on bottom substrates of soft mud and fine sediments (Bigelow and Schroeder 1953, McEachran and Musick 1975, Scott 1982 in Packer et al. 2003d).

Little information is known of the life history of the smooth skate (Packer et al. 2003d). Eggs of all skates are known to be encapsulated in a leathery capsule that rests on the bottom (Sosebee 2000, Packer et al. 2003d). The eggs hatch fully developed, so there is no larval stage (Sosebee 2000, McEachran 2002 in Packer et al. 2003d). Females with fully formed egg capsules are found in both summer and winter (McEachran 2002 in Packer et al. 2003d), but no other information on spawning times or locations is available. The primary food source for the smooth skate is epifaunal crustaceans, with decapod shrimps and mysids also being important (McEachran 1973, McEachran et al. 1976, Bowman et al. 2000, McEachran 2002 in Packer et al. 2003d). Skates do not migrate substantially, but do generally move offshore in summer and early autumn, and onshore during winter and spring (Sosebee 2000). No seasonal trends in abundance were identified by McEachran and Musick (1975 in Packer et al. 2003d). Inshore trawl surveys in Massachusetts identified juveniles in both the spring and fall near Cape Cod Bay (Packer et al. 2003d).

The PNPS intake and discharge have the potential to adversely affect EFH for the smooth skate. However, it is unlikely that PNPS intake operations are adversely affecting juvenile smooth skate as the species has not been entrained or impinged at PNPS (Normandeau 2006a, Normandeau 2006b). Due to the small area affected by the thermal plume and because the smooth skate would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile smooth skate EFH. It is unlikely that continued operation of PNPS would have a impact on prey items of the smooth skate, as its diet consists primarily of benthic invertebrates. Continued PNPS operations are likely to have a minimal adverse effect, if any, on EFH for the smooth skate.

Spiny dogfish (*Squalus acanthias*)

EFH for spiny dogfish juveniles and adults exists in the vicinity of PNPS. EFH for both juveniles and adults includes both offshore and inshore habitats. The offshore EFH includes waters of the continental shelf in areas that encompass the highest 90 percent of all ranked 10-minute squares for the area where juvenile dogfish were collected in the NEFSC trawl surveys. Inshore EFH encompasses the saline portions of the estuaries where dogfish are common or abundant on the Atlantic coast, from Passamaquoddy Bay, Maine to Cape Cod Bay, Massachusetts. Both juveniles are typically found in water with temperatures ranging from 37°F to 82°F, and at water depths ranging from 33 to 1476 ft (NMFS 2006).

The adult spiny dogfish is a voracious and opportunistic predator and is reported to prey on a variety of fish, mollusks, and crustaceans. The species travels in large packs and attacks schools of fish, including cod, haddock, capelin (*Mallotus villasus*), mackerel, herring, and sand lance (McMillan and Morse 1999). Spiny dogfish migrate annually in schools from winter habitat on the edge of the continental shelf to summer habitat in the Gulf of Maine and Georges Bank. Trawl surveys conducted in Massachusetts identified an abundance of adult spiny dogfish within

Cape Cod Bay in the spring. Both juveniles and adults were abundant within Cape Cod Bay in the fall (McMillan and Morse 1999).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult spiny dogfish EFH. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult spiny dogfish as the species has not been reported to be entrained at PNPS (Normandeau 2006a). The spiny dogfish has also only been periodically observed in the PNPS impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the spiny dogfish would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult spiny dogfish EFH. Continued operation of PNPS may also have the potential to affect prey items of juvenile and adult spiny dogfish, as several prey items of the spiny dogfish (cod, haddock, mackerel, herring, and sand lance) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the spiny dogfish.

Summer flounder (*Paralicthys dentatus*)

EFH for summer flounder adults exists in the vicinity of PNPS. Offshore EFH includes demersal waters of the continental shelf from the Gulf of Maine to Cape Hatteras, and inshore EFH includes estuaries where summer flounder are identified as being common or abundant. Summer flounder adults typically live in water depths shallower than 500 ft (NMFS 2006). In southern New England and the mid Atlantic, spawning occurs primarily in September (Berrien and Sibunka 1999 in Packer et al. 1999). Spawning occurs in open ocean areas of the shelf (Packer et al. 1999), in waters ranging from 30 to 200 m (98 to 656 ft) deep (ENSR 2000). The timing of spawning coincides with maximum production of autumn plankton, which is the primary food source for larvae (Morse 1981 in Packer et al. 1999).

Both eggs and larvae of the species are buoyant and pelagic. Eggs are most abundant in the northwest Atlantic in October and November, and larvae are most abundant from October to December (Able et al. 1990 in Packer et al. 1999). The larvae are transported toward coastal areas by the prevailing water currents, and development of post-larvae and juveniles occurs primarily within bays and estuarine areas (ENSR 2000). Juvenile summer flounder feed upon crustaceans and polychaetes, and as they grow larger they begin to feed more on fish (Packer et al. 1999). Adults are opportunistic feeders, preying mostly on fish and crustaceans (Packer et al. 1999). Species preyed upon include windowpane flounder, winter flounder, Atlantic menhaden, red hake, silver hake, scup, Atlantic silverside, and bluefish, among others (Packer et al. 1999). Adult summer flounder in Massachusetts migrate inshore in May and migrate to offshore waters in late fall (Packer et al. 1999). The shoal waters of Cape Cod Bay, including estuaries and harbors, are considered to be critically important habitat for the species (Packer et al. 1999).

The PNPS intake and discharge have the potential to adversely affect adult summer flounder EFH. However, it is unlikely that PNPS intake operations are adversely affecting adult summer flounder as eggs and larvae of the species have not been commonly entrained at PNPS (Normandeau 2006a), and summer flounder have only been infrequently observed in the impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the summer flounder would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult summer flounder EFH. Continued operation of PNPS may also have the potential to affect prey items of adult summer flounder, as several prey items of the summer flounder (windowpane flounder, winter flounder, Atlantic menhaden, red hake, silver hake, scup, and Atlantic silverside) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a less than substantial adverse effect on EFH for the summer flounder.

Surf clam (*Spisula solidissima*)

EFH for surf clam juveniles and adults exists in the vicinity of PNPS. EFH for both juveniles and adults includes the substrate to a depth of 3 ft below the sediment/water interface from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ. Both juveniles and adults are typically found in water depths ranging from the beach zone to 200 ft (NMFS 2006).

Surf clams are planktivorous siphon feeders whose diet includes diatoms and ciliates (Cargnelli et al. 1999c). They are preyed upon by moon snails, boring snails, and predatory fish such as haddock and cod. Surf clams are capable of reproduction in their first year of life, although they may not reach full maturity until the second year (Weinberg 2000). Water currents in areas where planktonic surf clam larvae live are important in determining eventual patterns of distribution and settlement for developing juveniles (ENSR 2000).

The PNPS intake and discharge have the potential to adversely affect juvenile and adult surf clam EFH. However, it is unlikely that PNPS intake operations are adversely affecting eggs or larval surf clams as the species has not been reported to be entrained or impinged at PNPS (Normandeau 2006a, Normandeau 2006b). The thermal discharge is unlikely to affect surf clam juveniles and adults because the affected area makes up a tiny portion of their EFH. Continued operation of PNPS may also have the potential to affect prey items of the surf clam as it is a filter feeder on plankton and entrainment by the plant removes plankton from the local environment. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the surf clam.

Thorny skate (*Amblyraja radiata)*

EFH for thorny skate juveniles and adults exists in the vicinity of PNPS. In the 2003 FMP for the Northeast Skate Complex (NEFMC 2003), EFH was designated for the thorny skate. This

designation included bottom habitats with substrates of sand, gravel, broken shell, pebbles, and soft mud in the Gulf of Maine, including portions of Cape Cod Bay, for both juveniles and adults (NEFMC 2003). The water depth of the thorny skate habitat can range from 18 to 1200 m (59 to 3937 ft) (McEachran 2002 in Packer et al. 2003c). Trawl surveys in the Gulf of Maine found most adults in the range from 71 to 300 m (233 to 984 ft), and at temperatures between 4°C and 9°C (Packer et al. 2003c). The species can be found over a variety of substrates, including sand, gravel, broken shell, pebbles, and soft mud (Bigelow and Schroeder 1953 in Packer et al. 2003c).

Eggs of all skates are known to be encapsulated in a leathery capsule that rests on the bottom (Sosebee 2000, Packer et al. 2003c). The eggs hatch fully developed, so there is no larval stage (Sosebee 2000, McEachran 2002 in Packer et al. 2003c). Based on the capture of females with fully formed egg capsules, spawning is thought to occur throughout the year, but with a peak during the summer (Templeman 1982a, McEachran 2002 in Packer et al. 2003c). The primary prey for the thorny skate is fish, including haddock, sand lance, and redfish (*Sebastes* Spp.) (Templeman 1982b in Packer et al. 2003c). Skates do not migrate substantially, but do generally move offshore in summer and early autumn, and onshore during winter and spring (Sosebee 2000).

The PNPS intake and discharge have the potential to adversely affect EFH for the thorny skate. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult thorny skate as the species has not been reported to be entrained or impinged at PNPS (Normandeau 2006a, Normandeau 2006b). Due to the small area affected by the thermal plume and because the thorny skate would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult thorny skate EFH. Continued operation of PNPS may also have the potential to affect prey items of juvenile and adult thorny skate, as one of the prey items of the thorny skate (sand lance) has been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a minimal adverse effect on EFH for thorny skate.

White hake (*Urophycis tenuis*)

EFH for white hake eggs, larvae, juveniles, and adults exists in the vicinity of PNPS. EFH for eggs is found in surface waters of the Gulf of Maine, Georges Bank, and southern New England. EFH for both larvae and pelagic juveniles is identified as pelagic waters of the Gulf of Maine, the southern edge of Georges Bank, and southern New England to the mid Atlantic. Demersal juvenile and adult EFH includes bottom habitats with substrates of seagrass, mud, or fine-grained sand in the Gulf of Maine, the southern edge of Georges Bank, and southern New England to the mid Atlantic. Demersal juveniles and adults live in water from 5 to 325 m (16 to 1066 ft) deep, and with a temperature below 19°C (for juveniles) and 14°C (for adults) (NMFS 2006). The white hake spawning grounds are centered on the Gulf of St. Lawrence, the southern Georges Bank, and Mid Atlantic Bight. The contribution of the Gulf of Maine as a spawning ground is reported to be negligible (Fahay and Able 1989 in Chang et al. 1999a). The eggs, larvae, and early juvenile

stages of the white hake are pelagic (Chang et al. 1999a), and are found in surface waters of the Gulf of Maine, Georges Bank and southern New England (NEFMC 1998a in ENSR 2000). Juvenile white hake feed mainly on polychaetes, shrimp, and other crustaceans, and adults feed primarily on crustaceans and other fish, including juvenile white hakes (Langston et al. 1994 in Chang et al. 1999a). Migration of adults occurs annually, with adults moving to shallower waters in the spring to spawn, and then moving offshore in the autumn. A summary of annual NMFS Bottom Trawl Survey data identified no white hake in Cape Cod Bay during the fall between 1979 and 2003, and only a few limited occurrences in the bay during the spring in those years (GOMCML 2006).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, and adult white hake EFH. White hake eggs and larvae are frequently observed in the PNPS entrainment sampling program (Normandeau 2006a). Life stages of the white hake have also been observed in the PNPS impingement sampling program continually over its operating history (Normandeau 2006b). However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult white hake as the area affected by the intake system is small. Due to the small area affected by the thermal plume and because the white hake would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult white hake EFH. Continued operation of PNPS may also have the potential to affect prey items of adult white hake, as the adults are known to prey on juveniles, which have been have been commonly reported in the impingement sampling program at PNPS. Continued PNPS operations are likely to have a less than substantial adverse effect on EFH for the white hake.

Whiting/Silver hake *(Merluccius bilinearis)*

EFH for eggs, larvae, juveniles, adults, and spawning adults of the whiting (also known as silver hake) exists in the vicinity of PNPS. EFH for eggs includes surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the mid-Atlantic region south to Cape Hatteras, with water depths between 50 to 150 m (164 to 492 ft) and temperatures below 20°C. For larvae, the EFH consists of surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the mid-Atlantic region south to Cape Hatteras. Larvae also are found at water depths between 50 to 150 m (164 to 492 ft) and temperatures below 20°C. Juvenile, adult, and spawning adult EFH for the whiting includes bottom habitats of all substrate types in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the mid-Atlantic region south to Cape Hatteras. Juveniles and adults typically live in water between 20 and 325 m (66 to 1066 ft) deep and temperatures below 22°C. Spawning typically occurs in water depths between 30 and 325 m (98 to 1066 ft) and at temperatures below 13°C (NMFS 2006). The adults spawn over a variety of substrates in the Gulf of Maine, Georges Bank, and the southern New England area south of Martha's Vineyard (Lock and Packer 2004). Spawning within the Gulf of Maine generally begins in June, with a peak in July to August (Lock and Packer 2004).

Whiting eggs and larvae are pelagic, existing in the water column at depths between 50 and 150 m (164 and 492 ft) (NEFMC 1998a in ENSR 2000). As larvae mature into juveniles, they settle to the bottom (Lock and Packer 2004). As adults, whiting are found in water at depths ranging from shallow to greater than 400 m (1312 ft) (Dery 1988, Bolles and Begg 2000 in Lock and Packer 2004). Juvenile whiting feed mainly on crustaceans (Cohen et al. 1990 in ENSR 2000), and the adults feed on both fish and pelagic invertebrates, such as shrimp and squid (Mayo 1998 in ENSR 2000). Whiting are a dominant predator species on the continental shelf in the northwest Atlantic, and their dominant biomass and high prey consumption help to regulate the ecosystem (Bowman 1984, Garrison and Link 2000 in Lock and Packer 2004). The migration of whiting is seasonal. The northern stock moves to the deep basins of the Gulf of Maine during the winter, and migrates into nearshore waters in the Gulf of Maine in the spring and summer (Lock and Packer 2004). Trawl surveys conducted for whiting in 1999 identified concentrations of whiting in Cape Cod Bay in spring and autumn (Reid et al. 1999 in Lock and Packer 2004). A summary of annual NMFS Bottom Trawl Survey data identified substantial numbers of whiting in Cape Cod Bay during the fall every year between 1979 and 2003, but found a more limited number in the bay during the spring in those years (GOMCML 2006).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, adults, and spawning adult EFH for whiting. Whiting eggs and larvae are frequently observed in the PNPS entrainment sampling program (Normandeau 2006a). Life stages of the whiting have also been observed in the PNPS impingement sampling program continually over the operating history of the facility (Normandeau 2006b). However, it is unlikely that PNPS intake operations are adversely affecting whiting as the area affected by the intake system is small. Due to the small area affected by the thermal plume and because the whiting would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult whiting EFH. Continued operation of PNPS may also have the potential to affect prey items of adult whiting, as several prey items of the whiting (small fish and squid) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations may have a substantial adverse effect on EFH for the whiting.

Windowpane flounder (*Scopthalmus aquosus*)

EFH for windowpane flounder eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs includes surface waters on the perimeter of the Gulf of Maine, Georges Bank, southern New England, and the mid-Atlantic region south to Cape Hatteras. EFH for larvae includes pelagic waters, with water depths between 50 to 150 m (164 to 492 ft) and temperatures below 20°C. For larvae, the EFH consists of surface waters on the perimeter of the Gulf of Maine, Georges Bank, southern New England, and the mid-Atlantic region south to Cape Hatteras. Both eggs and larvae are found in water depths less than 70 m (230 ft), and in water temperatures below 20°C. Juvenile, adult, and spawning adult EFH includes bottom habitats with substrates of mud or fine-grained sand on the perimeter of the Gulf of Maine, Georges Bank,

southern New England, and the mid-Atlantic region south to Cape Hatteras. These areas are generally 1 to 100 m (3 to 328 ft) deep and have water temperatures below 26°C (NMFS 2006). The windowpane flounder prefers a soft bottom substrate for spawning, and generally spawns between April and December, with peak spawning activity in July and August on Georges Bank and in May in the mid-Atlantic region (NEFMC 1998a, Hendrickson 1998 in ENSR 2000). Both the eggs and larvae are pelagic, and exist in surface waters cooler than 20°C (NEFMC 1998a in ENSR 2000). The prey for the windowpane flounder is small benthic invertebrates, including polychaete worms and amphipods. The species may also prey on small forage bony fish species (Langston and Bowman 1981 in ENSR 2000). Juveniles living in shallow waters tend to move to deeper waters as they mature (Chang et al. 1999b). In studies in Massachusetts, juveniles were most abundant in inshore waters at depths of less than 20 m (66 ft) and at water temperatures between 5°C to 12°C in the spring and between 12°C to 19°C in the fall (Chang et al. 1999b).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH for eggs, larvae, juvenile, adults, and spawning adult windowpane flounder. Eggs of the windowpane flounder dominated entrainment samples at PNPS (ENSR 2000, Normandeau 2006a). Larvae have also been consistently collected in the plant's entrainment sampling program throughout the history of the facility (Normandeau 2006a). In addition, windowpane flounder have been continually observed in the PNPS impingement sampling program throughout the history of the facility (Normandeau 2006b). Due to the small area affected by the thermal plume and because the windowpane flounder would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult windowpane flounder EFH. Continued operation of PNPS may also have the potential to affect prey items of the windowpane flounder, as one of its prey items (small fish) has been commonly reported in the impingement and entrainment sampling program at PNPS. Continued operations of PNPS may have a adverse effect substantial effect on EFH for the windowpane flounder.

Winter flounder (*Pseudopleuronectes americanus*)

EFH for winter flounder eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs includes bottom habitats with substrates of sand, muddy sand, and gravel on the Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the mid-Atlantic region south to Delaware Bay. Eggs are typically found in water at depths less than 5 m (16 ft), and in water with temperatures less than 10°C. Larval EFH occurs in pelagic and bottom waters of Georges Bank, inshore areas of the Gulf of Maine, southern New England, and the mid-Atlantic region south to Delaware Bay. Larval EFH includes water less than 6 m (20 ft) deep and with temperatures below 15°C. EFH for juvenile winter flounder includes bottom habitats with substrates of mud or fine-grained sand on Georges Bank, inshore areas of the Gulf of Maine, southern New England, and the mid-Atlantic region south to Delaware Bay. Young of year juveniles are found at water depths from 0.1 to 10 m (0.3 to 33 ft) and temperatures below

28°C. Age 1+ juveniles are found at water depths ranging from 1 to 50 m (3 to 164 ft) and at temperatures below 25°C. EFH for both adults and spawning adults includes bottom habitats, including estuaries, with substrates of mud, muddy sand, sand, and gravel on Georges Bank, inshore areas of the Gulf of Maine, southern New England, and the mid-Atlantic region south to the Delaware Bay. Adult winter flounder live in water at depths ranging from 1 to 100 m (3 to 328 ft) with temperatures below 25°C. Spawning adults are found at water depths less than 6 m (262 ft), except for on Georges Bank, where they spawn as deep as 80 m. Water temperatures for spawning adults are typically below 15°C (NMFS 2006). Spawning takes place at night over sandy bottoms in shallow estuaries starting in mid December and ending in May, with a peak in the February to March time frame.

The various life stages of winter flounder can generally be found in areas where the bottom habitat has a substrate of mud, sand, or gravel (NEFMC 1998b). Winter flounder eggs are demersal, adhesive, and stick together in clusters, and hatching may occur in 2 to 3 weeks, depending upon the water temperature (Bulloch 1986; Pereira et al.1999). Larvae are initially planktonic, but, as metamorphosis continues, they settle to the bottom. Newly metamorphosed young of year fish take up residence in shallow water. Pereira et al. (1999) describes winter flounder as omnivorous or opportunistic feeders, consuming a wide variety of prey, with polychaetes and amphipods making up the majority of their diet. Typically adult winter flounder migrate inshore in the fall and early winter and spawn in later winter and early spring. Then they may leave inshore areas if the water temperature exceeds 15°C, although there may be exceptions to this due to water temperature and food availability (Pereira 1999). Winter flounder may move significant distances (Pereira et al. 1999); however, they also can exhibit a high degree of fidelity and, in general, their movement patterns are localized (Nitschke et al. 2000). Studies done by PNPS have shown that winter flounder in the area immediately surrounding PNPS (i.e., in Plymouth Outer Harbor) have relatively localized movements and are basically confined to inshore waters (Lawton et al. 1999), resulting in highly localized populations (Lawton et al. 2000).

The intake and discharge at PNPS have the potential to adversely affect a small portion of EFH for eggs, larvae, juvenile, adults, and spawning adult winter flounder. The winter flounder eggs and larvae dominated entrainment samples at PNPS (Normandeau 2006a). Impingement of winter flounder has consistently occurred throughout the operating history of the facility; however, the impingement rates are considered to be low. Due to the small area affected by the thermal plume and because the winter flounder would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult winter flounder EFH. Continued operation of PNPS may also have the potential to affect prey items of the winter flounder, as they have been described as omnivores preying on a variety of fish and invertebrates species, many of which have been commonly reported in the impingement and entrainment sampling program at PNPS. However, there is a potential that continued operations of the PNPS intake system may have a substantial, adverse effect on EFH for winter flounder.

Winter skate (*Leucoraja ocellata*)

EFH for winter skate juveniles and adults exists in the vicinity of PNPS. In the 2003 FMP for the Northeast Skate Complex (NEFMC 2003), EFH was designated for the winter skate. This designation included bottom habitats with substrates of sand, gravel, and mud in Cape Cod Bay for both juveniles and adults (NEFMC 2003). Winter skates in the Gulf of Maine primarily live at depths of 46 to 64 m (151 to 210 ft) (Bigelow and Schroeder 1953; McEachran 2002 in Packer et al. 2003a). The species can live in a variety of water temperatures and are reported near the Massachusetts coast in water from 1°C to 20°C (Bigelow and Schroeder 1953 in Packer et al. 2003a). The species prefers sandy and gravel bottom substrates (Scott 1982a in Packer et al. 2003a).

Little information on the life history of the winter skate exists. Eggs of all skates are known to be encapsulated in a leathery capsule that rests on the bottom (Sosebee 2000, Packer et al. 2003a). The eggs hatch fully developed, so there is no larval stage (Sosebee 2000, McEachran 2002 in Packer et al. 2003a). Off of Nova Scotia and in the Gulf of Maine, spawning occurs during summer and fall (Bigelow and Schroeder 1953 in Packer et al. 2003a). The predominant food source for winter skates is polychaetes and amphipods, with additional feeding upon decapods, isopods, bivalves, and fish (McEachran 1973 in Packer et al. 2003a). Fish species that are prey for the winter skate include smaller skates, eels (*Anguilla rostrata*), alewives, blueback herring (*Alosa aestivalis*), menhaden, smelt, sand lance, chub mackerel (*Scomber colias*), butterfish, cunners, and silver hake (Bigelow and Schroeder 1953 in Packer et al. 2003a). Skates do not migrate substantially, but do generally move offshore in summer and early autumn and onshore during winter and spring (Sosebee 2000).

The PNPS intake and discharge have the potential to adversely affect EFH for the winter skate. However, it is unlikely that PNPS intake operations are adversely affecting juvenile and adult winter skate as the species has not been reported to be entrained at PNPS (Normandeau 2006a) and it has only been periodically observed in the PNPS impingement sampling program (Normandeau 2006b). Due to the small area affected by the thermal plume and because the winter skate would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult winter skate EFH. Continued operation of PNPS may also have the potential to affect prey items of the winter skate, as several of its prey items (small skates, alewife, menhaden, smelt, sand lance, butterfish, cunner, and silver hake) have been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a less than substantial adverse effect on EFH for winter skate.

Witch flounder (*Glyptocephalus cynoglossus*)

EFH for witch flounder eggs and larvae exists in the vicinity of PNPS. EFH for eggs of the species includes surface waters of the Gulf of Maine, Georges Bank, the continental shelf off

southern New England, and the mid-Atlantic region south to Cape Hatteras. EFH for larvae is found in surface waters to a depth of 250 m (820 ft) in the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the mid-Atlantic region south to Cape Hatteras. Both eggs and larvae are found in water with temperatures below 13°C (NMFS 2006). Spawning occurs from March to November, with peak spawning during the summer, at temperatures from 0 to 10°C (Bigelow and Schroeder 1953 in Cargnelli et al. 1999h). The western and northern areas of the Gulf of Maine are reported to be the most active spawning areas for the species (Burnett et al. 1992 in Cargnelli et al. 1999h).

Eggs are released on the bottom, but are pelagic and rise to the surface. Larvae are also pelagic, and juveniles descend to the bottom at the age of 4 to 12 months (Bigelow and Schroeder 1953,; Evseenko and Nevinsky 1975 in Cargnelli et al. 1999h). The primary prey for the witch flounder is polychaetes and crustaceans, with additional contribution from mollusks and echinoderms (Cargnelli et al. 1999h). All life stages of witch flounder are common in Massachusetts Bay. Eggs were found to be abundant in Massachusetts Bay in the months of May and June, and the highest larval densities found were observed in Massachusetts Bay (Cargnelli et al. 1999h). Bottom trawl surveys and inshore surveys found the greatest concentrations of juveniles on Stellwagen Bank in Massachusetts Bay. Adults were found in the highest concentrations in Massachusetts Bay in the autumn, including some catches in Cape Cod Bay (Cargnelli et al. 1999h).

The PNPS intake and discharge have the potential to adversely affect egg and larvae witch flounder EFH. Witch flounder eggs and larvae have been observed in the PNPS entrainment sampling program throughout the operating history of the facility (Normandeau 2006a), while the witch flounder has not been observed in the PNPS impingement sampling program (Normandeau 2006b). However, it is unlikely that PNPS intake operations are adversely affecting witch flounder as the area makes up a tiny portion of their EFH. The thermal plume is unlikely to affect EFH for witch flounder eggs and larvae. It is unlikely that continued operation of PNPS would have a impact on prey items of the witch flounder, as its diet consists primarily of benthic invertebrates. Continued PNPS operations are likely to have a minimal adverse effect on EFH for the witch flounder.

Yellowtail flounder (*Pleuronectes ferruginea*)

EFH for yellowtail flounder eggs, larvae, juveniles, adults, and spawning adults exists in the vicinity of PNPS. EFH for eggs and larval yellowtail flounder includes surface waters of Georges Bank, Massachusetts Bay, Cape Cod Bay, and the southern New England continental shelf south to Delaware Bay. Eggs and larvae are found in water at depths between 10 to 90 m (33 to 295 ft), and temperatures below 17°C. Juvenile, adult, and spawning adult EFH occurs in bottom habitats with substrates of sand or mud on Georges Bank, the Gulf of Maine, and the southern New England shelf south to Delaware Bay. Juveniles and adults live in water at depths ranging from 20 to 50 m (66 to 164 ft) and temperatures below 15°C. Spawning occurs in water at depths

from 10 to 125 m (33 to 410 ft) and temperatures below 17°C (NMFS 2006). Spawning occurs in the Gulf of Maine, Georges Bank, and the southern New England shelf during the spring and summer months (Overholtz and Cadrin 1998; NEFMC 1998a in ENSR 2000).

Both the eggs and larvae of the yellowtail flounder reside in the water column and are found in surface waters between mid March and July, peaking between April and June. Larvae may drift in surface waters before developing into juveniles and dropping to the bottom (Overholtz and Cadrin 1998 in ENSR 2000). Adult yellowtail flounder feed on small benthic invertebrates such as polychaete worms, isopods, shrimp, and amphipods, and also can feed on small forage fish (Cooper et al. 1998 in ENSR 2000). Mark and recapture studies have shown that the yellowtail flounder do not migrate, other than minor movements between shallow and deeper water in response to seasonal temperature variation (Royce et al. 1959; Lux 1964 in Johnson et al. 1999).

The PNPS intake and discharge have the potential to adversely affect egg, larvae, juvenile, adults, and spawning adult yellowtail flounder EFH. Yellowtail flounder eggs and larvae have been consistently collected in the PNPS entrainment sampling program throughout the operating history of the plant (Normandeau 2006a). The yellowtail flounder has also been periodically collected in the PNPS impingement sampling program (Normandeau 2006b). However, it is unlikely that PNPS intake operations are adversely affecting yellowtail flounder as the area affected by the intake system is small. Due to the small area affected by the thermal plume and because the yellowtail flounder would exhibit behavioral avoidance if water temperatures are not within their preference range, it is unlikely that the PNPS discharge would affect juvenile and adult yellowtail flounder EFH. Continued operation of PNPS may also have the potential to affect prey items of the yellowtail flounder, as one of its prey items (small fish) has been commonly reported in the impingement and entrainment sampling program at PNPS. Continued PNPS operations are likely to have a less than substantial adverse effect on EFH for the yellowtail flounder.

7.0 Impact Avoidance, Minimization, and Mitigation Measures

Operation of the PNPS once-through cooling system may adversely affect EFH in Cape Cod Bay. The NPDES permit allows the PNPS cooling system to operate if it does not exceed specified entrainment, impingement, and discharge limits. The NPDES permit also requires mitigation measures, which are in place at PNPS.

The staff has identified a variety of measures that could mitigate potential impacts resulting from continued operation of the PNPS cooling water system.[a] These could include:

- Behavioral barriers
- Diversion devices
- Alternative intake systems
- Alternative intake screen systems
- Closed cycle systems
- Variable speed pumps
- Cooling water flow adjustments
- Scheduled outages
- Movement of fish return
- Habitat restoration
- Fish stocking

The NRC staff has not conducted an analysis of each of these measures relative to their applicability to PNPS. This discussion is only meant to provide a brief overview of these technologies. ENSR (2000) conducted an analysis of several of these technologies in the 316(b) demonstration report as required by Section 316 of the Clean Water Act. It is expected that a more thorough analysis of the costs and benefits of these technologies would be conducted as part of the 316(b) comprehensive demonstration study currently being conducted by PNPS in support of the NPDES permit renewal.

Behavioral barriers are designed to cause fish to actively avoid entry into an area. These may include sound, light, or air bubbles (Clay 1995). Sound barriers, which would be located at an intake structure, would include low-frequency, infra-wave sound; pneumatic or mechanically generated low-frequency sounds; or transducer-generated sound. Light barriers may emit a constant or strobe-type beam of light, while air bubble curtains produce a continuous, dense chain of bubbles. Both barrier types may deter some species of fish from entering the intake structure. ENSR (2000) determined that, of the behavioral barriers evaluated, light barriers would be the most effective as several studies have shown that some fish species are attracted to light. However, this technology is still considered to be experimental in nature and will only be effective on species/life stages that can actively respond to a stimulus (i.e., not fish eggs, early larval life stages, or other planktonic organisms).

(a) It should be noted that the NRC cannot impose mitigation requirements on the applicant. The Atomic Safety and Licensing Appeal Board, in the "Yellow Creek" case determined that EPA has sole jurisdiction over the regulation of water quality with respect to the withdrawal and discharge of waters for nuclear power stations, and that the NRC is prohibited from placing any restrictions or requirements upon the licensees of these facilities with regards to water quality [Tennessee Valley Authority (Yellow Creek Nuclear Plant, Units 1 and 2), ALAB-515, 8 NRC 702, 712-13 (1978)].

Diversion devices are the most commonly used barriers and are physical structures such as louvers, barrier nets, or chains and cables that are designed to guide fish away from a certain area, such as the intake (Clay 1995). Louvers consist of a series of evenly spaced vertical slats which create localized turbulence that fish can detect and actively avoid. Louvers typically have a smaller spacing between the slats or bars than a standard trash rack. Barrier nets are simply nets placed across an intake channel to prevent fish from access to an intake structure. The design of a barrier net system has to finely balance the mesh size with the intake requirements.[(b)] Chains or cables may be vertically hung in an intake structure to form a physical and visible barrier to fish. However, similar to barrier nets, they may alter hydraulic flow patterns in an intake (ENSR 2000). These types of structures also only affect those organisms that can actively respond and would not impact entrainment or impingement of fish eggs, larvae, or other planktonic organisms.

Another type of mitigation measure may be an alternative intake system. An alternate surface water intake system could include an offshore intake structure with a velocity cap. Vertical placement of the offshore intake within the water column would be a major factor in impingement and entrainment reduction. For example, ENSR (2000) conducted an evaluation of this type of structure and determined that it would result in lower fish impingement but an increased entrainment rate, especially for winter flounder as later stages of winter flounder larvae (stages 3 and 4) tend to settle on the bottom substrate. The Seabrook Station Nuclear Power Plant utilizes a similar structure, however, the intake structure opening is at mid-depth. Based on an analysis by Saila et al., (1997), the losses due to entrainment at this facility are less than the losses observed at other facilities. Groundwater could also be potentially used as a cooling water source. According to EPA Region 1, the Keyspan North Point Station is currently conducting a pilot study to evaluate the feasibility of using offshore groundwater extraction as a cooling water source (Earth Tech 2006a).

Alternative intake screen systems may include Ristroph traveling screens, wedgewire screens, and/or fine-mesh screens. Ristroph screens are traveling screens fitted with fish buckets that collect fish and lift them out of the water where they are gently sluiced away prior to debris removal with a high pressure spray. They have been approved as the best available technology in several states (Siemens 2006). Recent studies have shown survival of species exceeding 95 percent when using the Ristroph screen (EPRI 2006). Wedgewire screens are constructed of wire of triangular cross sections so that the surface of the screen is smooth while the screen openings widen inwards (ENSR 2000). This type of screen has been widely used for hydropower diversion structures and has been shown to essentially eliminate impingement and reduce larval entrainment (ENSR 2000). Fine mesh screens are simply wire screens with the mesh sized to minimize ichthyoplankton entrainment. As reported in ENSR (2000), fine mesh screens have not proven effective at reducing winter flounder larvae entrainment losses. However, as with any

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(b) EPA has suggested the Gunderboom fabric barrier as a potential mitigation measure. However, NRC staff does not consider it as an option because it could present safety issues at intakes of nuclear power plants.

screen, the smaller the mesh the more clogging and fouling problems. Another potential mitigation strategy related to the cooling system would be to rotate the existing screens more often or on a continual basis. This would increase the survival of impinged organisms, but it would have no impact on the impingement rate or entrainment.

Closed-cycle systems recycle cooling water in a closed piping system and utilize evaporative cooling (such as is in a cooling tower or pond) as a means of dissipating the heat from the condensers. Wet and hybrid cooling towers would still require withdrawal of water from the bay to make up for water losses due to blowdown and evaporation. However, the water withdrawal rate would be significantly lower than the current once-through cooling system. A dry cooling tower utilizes ambient air to dissipate heat, essentially acting as an automobile radiator (ENSR 2000). No make-up water is required for this type of system as the steam is condensed in a closed cycle. However, this results in lower plant efficiency, thus requiring more fuel to produce the same amount of electricity (ENSR 2000).

Adjustments to the flow of cooling water through the plant is another type of mitigation strategy that may be applicable to PNPS. This could include the use of variable speed pumps, cooling water bypass flow, or rotating the existing screens more often or continuously. Variable-speed pumps would reduce the intake flow during periods of peak entrainment or impingement. These have been shown to be effective at reducing impingement and entrainment, but by reducing the amount of cooling water moving through the system, power generating efficiency may decrease and the thermal plume may increase in size (ENSR 2000). Cooling water bypass flow would reduce the cooling water flow rate through the condensers and add a corresponding amount of bypass flow into the discharge canal (ENSR 2000). This alternative assumes that mortality in the discharge canal would be less than the condensers. It would most likely reduce entrainment but not impingement (ENSR 2000).

Another potential mitigation strategy may be to schedule outages for performing regular inspection, maintenance, and refueling during the peak spawning season of specific fish species such as the winter flounder, Atlantic menhaden, or rainbow smelt.

Movement of the fish return sluiceway discharge point may also provide some mitigation benefits as impinged fish are currently returned to the intake canal where potentially stunned, disoriented, or injured fish may not be able to actively avoid reentering the intake structure.

Habitat restoration and fish stocking are also potential mitigation strategies. However, these are compensatory measures as opposed to preventative measures, which are the preferred mitigation strategies of Federal and State resource agencies. Several studies have been funded by Entergy over the last few years to evaluate these options. A monitoring pilot program has been conducted by Entergy to assess the feasibility of improving the local winter flounder stock by releasing flounder into the Plymouth area. Up to 25,000 young of year winter flounder, ranging from 26 to 34 mm (1 to 1.3 in.) in length, have been released into Plymouth Harbor on an annual basis since

2001. Post-release sampling has indicated that the released fish do survive and grow well when released earlier in the season (Marine Research, Inc. 2006). No genetic studies have been conducted to determine if released hatchery fish breed with the wild stock. Stocking of young of year fish or eggs may be a proven mitigation strategy; however, both the EPA and MDMF have stated that re-stocking is not a preferred mitigation alternative (Earth Tech 2006a).

8.0 Conclusions

The potential impacts of PNPS on Federally managed species and their EFH in the vicinity of PNPS have been evaluated. Known distributions and records of those species, the ecological impacts of the operations and maintenance activities of PNPS, and the mitigation measures that Entergy has implemented to avoid, minimize, and mitigate impacts to the various life history stages of these species have been considered in this EFH assessment.

Continued operation of the PNPS cooling water system was determined to have a minimal adverse effect on EFH for 17 species, a less than substantial adverse effect on EFH for 8 species, and a substantial adverse effect on EFH for 7 species. However, within the overall Cape Cod Bay ecosystem, the staff has determined that continued operation of the PNPS cooling water system would have a minimal adverse effect on EFH.

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Appendix F

GEIS Environmental Issues Not Applicable to Pilgrim Nuclear Power Station

Appendix F

GEIS Environmental Issues Not Applicable to Pilgrim Nuclear Power Station

Table F-1 lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996; 1999)[a] and 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are not applicable to Pilgrim Nuclear Power Station (PNPS) because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to Pilgrim Nuclear Power Station (PNPS)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered thermal stratification of lakes	1	4.2.1.2.2 4.4.2.2	PNPS does not discharge into a lake.
Eutrophication	1	4.2.1.2.3 4.4.2.2	PNPS does not discharge into a lake.
Discharge of sanitary wastes and minor chemical spill	1	4.2.1.2.4 4.4.2.2	PNPS does not discharge sanitary waste to surface waters.
Water-use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	2	4.3.2.1 4.4.2.1	PNPS does not have a cooling tower or a cooling pond and does not use make-up water from a small river with low flow.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

Table F-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
AQUATIC ECOLOGY (FOR ALL PLANTS)			
Premature emergence of aquatic insects	1	4.2.2.1.7 4.4.3	Aquatic insects are primarily of concern in freshwater environments.
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER BASED HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at PNPS.
Impingement of fish and shellfish	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at PNPS.
Heat shock	1	4.3.3	This issue is related to heat-dissipation systems that are not installed at PNPS.
GROUNDWATER USE AND QUALITY			
Groundwater use conflicts (potable and service water, and dewatering; plants that use >100 gpm and plants that use < 100 gpm)	2	4.8.1.1 4.8.2.1	PNPS does not use groundwater for cooling water purposes.
Groundwater-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.8.1.3 4.4.2.1	This issue is related to heat-dissipation systems that are not installed at PNPS.
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	PNPS does not have or use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	PNPS does not have or use Ranney wells.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	PNPS does not use cooling ponds.
Groundwater quality degradation (cooling ponds at inland sites)	2	4.8.3	PNPS is not located at an inland site.

Table F-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to a heat-dissipation system that is not installed at PNPS.
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to a heat-dissipation system that is not installed at PNPS.
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to a heat-dissipation system that is not installed at PNPS.
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to a heat-dissipation system that is not installed at PNPS.
HUMAN HEALTH			
Microbial organisms (occupational health)	1	4.3.6	This issue is related to a heat-dissipation system that is not installed at PNPS.
Microbial organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river).	2	4.3.6	This issue is related to a heat-dissipation system that is not installed at PNPS.

F.1 References

10 CFR 51. Code of Federal Regulations, *Title 10, Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

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Appendix G

U.S. Nuclear Regulatory Commission Staff Evaluation of Severe Accident Mitigation Alternatives for Pilgrim Nuclear Power Station

Appendix G

U.S. Nuclear Regulatory Commission Staff Evaluation of Severe Accident Mitigation Alternatives for Pilgrim Nuclear Power Station

G.1 Introduction

Entergy Nuclear Operations, Inc. (Entergy) submitted an assessment of severe accident mitigation alternatives (SAMAs) for Pilgrim Nuclear Power Station (PNPS) as part of the environmental report (ER) (Entergy 2006a). This assessment was based on the most recent PNPS probabilistic safety assessment (PSA) available at that time, a plant-specific off-site consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer code, and insights from the PNPS individual plant examination (IPE) (BECo 1992) and individual plant examination of external events (IPEEE) (BECo 1994). In identifying and evaluating potential SAMAs, Entergy considered SAMAs that addressed the major contributors to core damage frequency (CDF) and population dose at PNPS, as well as SAMA candidates for other operating plants which have submitted license renewal applications. Entergy identified 281 potential SAMA candidates. This list was reduced to 59 unique SAMA candidates by eliminating SAMAs that are not applicable to PNPS due to design differences, have already been implemented at PNPS, or are similar in nature and could be combined with another SAMA candidate. Entergy assessed the costs and benefits associated with each of the potential SAMAs and concluded in the ER that several of the candidate SAMAs evaluated are potentially cost-beneficial.

Based on a review of the SAMA assessment, the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) to Entergy by letter dated May 22, 2006 (NRC 2006a). Key questions concerned: findings of the Boiling Water Reactor Owners Group (BWROG) and the independent assessment team reviews of the PNPS PSA; changes to the Level 2 PSA model since the IPE; justification for the multiplier used for external events; further information on several specific candidate SAMAs and low cost alternatives; and details for several of the cost estimates provided. Entergy submitted additional information by letters dated July 5, 2006, August 30, 2006, and October 6, 2006 (Entergy 2006b, 2006c, 2006d). In the responses, Entergy provided: information regarding the findings of the BWROG and independent assessment team reviews; a discussion of the Level 2 analysis and the process for assigning severe accident source terms; a revised assessment of the baseline SAMA benefits considering a modified multiplier to account for external events exclusive of uncertainties; additional information regarding several specific SAMAs; and additional information pertaining to the cost estimates. Entergy's responses addressed the NRC staff's concerns.
An assessment of SAMAs for PNPS is presented below.

G.2 Estimate of Risk for Pilgrim Nuclear Power Station

Entergy's estimates of off-site risk at PNPS are summarized in Section G.2.1. The summary is followed by the NRC staff's review of Entergy's risk estimates in Section G.2.2.

G.2.1 Entergy's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the PNPS Level 1 and 2 PSA model, which is an updated version of the IPE (BECo 1992), and (2) a supplemental analysis of off-site consequences and economic impacts (essentially a Level 3 PSA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent PNPS Level 1 and 2 PSA model available at the time of the ER, referred to as the PNPS PSA (Revision 1, April 2003 model). The scope of the PNPS PSA does not include external events.

The baseline CDF for the purpose of the SAMA evaluation is approximately 6.4×10^{-6} per year. The CDF is based on the risk assessment for internally-initiated events. Entergy did not include the contribution from external events within the PNPS risk estimates; however, it did account for the potential risk reduction benefits associated with external events by multiplying the estimated benefits for internal events by a factor of 5.[(a)] This is discussed further in Section G.6.2.

The breakdown of CDF by initiating event is provided in Table G-1. As shown in this table, events initiated by loss of direct current (DC) buses and loss of off-site power are the dominant contributors to CDF. Station blackout (SBO) sequences contribute 1.5×10^{-7} per year (about 2 percent of the total internal events CDF), while anticipated transient without scram (ATWS) sequences are insignificant contributors to CDF (5.3×10^{-8} per year).

(a) In the ER, Entergy bounded the combined impact of external events and uncertainties by applying a multiplier of 6 to the estimated SAMA benefits for internal events. In response to an RAI, Entergy revised the analysis to include a multiplier of 5 to account for potential SAMA benefits in both internal and external events, and provided a separate accounting of uncertainties (Entergy 2006b).

Table G-1. PNPS Core Damage Frequency

Initiating Event	CDF (Per Year)	% Contribution to CDF
Loss of DC power buses	3.1×10^{-6}	48
Loss of off-site power	1.3×10^{-6}	20
Loss of alternating current (AC) power buses	8.8×10^{-7}	14
Loss of salt service water	3.9×10^{-7}	6
Transients	3.6×10^{-7}	6
Loss of coolant accidents	1.8×10^{-7}	3
Station blackout	1.5×10^{-7}	2
Anticipated transient without scram	5.3×10^{-8}	1
Interfacing system loss-of-coolant (LOCA)	3.6×10^{-8}	<1
Internal flooding	1.3×10^{-8}	<1
Total CDF (from internal events)	**6.4×10^{-6}**	**100**

The Level 2 PNPS PSA model that forms the basis for the SAMA evaluation represents a complete revision of the original IPE Level 2 model. The current Level 2 model utilizes a single containment event tree (CET) containing both phenomenological and systemic events. The Level 1 core damage sequences are binned into one of 48 Plant Damage State (PDS) bins which provide the interface between the Level 1 and Level 2 analysis. CET nodes are evaluated using supporting fault trees and logic rules.

The result of the Level 2 PSA is a set of 19 Collapsed Accident Progression Bins (CAPBs) with their respective frequency and release characteristics. The results of this analysis for PNPS are provided in Table E.1-11 of the ER (Entergy 2006a). The frequency of each CAPB was obtained by summing the frequency of the individual PDS accident progression CET endpoints binned into the CAPB. The release characteristics for each CAPB were obtained by frequency-weighting the release characteristics for each PDS contributing to the CAPB.

The off-site consequences and economic impact analyses use the MACCS2 code to determine the off-site risk impacts on the surrounding environment and public. Inputs for these analyses include plant-specific and site-specific input values for core radionuclide inventory, source term

and release characteristics, site meteorological data, projected population distribution (within a 50-mile (mi) radius) for the year 2032, emergency response evacuation modeling, and economic data. The core radionuclide inventory is derived from an Oak Ridge Isotope Generator (ORIGEN) calculation assuming a 4.65 percent enrichment and average burnup (Entergy 2006b). The magnitude of the on-site impacts (in terms of clean-up and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (NRC 1997a).

In the ER, Entergy estimated the dose to the population within 50 miles of the PNPS site to be approximately 0.136 person-sievert (Sv) (13.6 person-roentgen equivalents man [person-rem]) per year. The breakdown of the total population dose by containment release mode is summarized in Table G-2. Containment failures within the late time frame (greater than 7.5 hours following event initiation) dominate the population dose risk at PNPS.

Table G-2. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	Population Dose (Person-Rem[1] Per Year)	Percent Contribution
Late Containment Failure	12.7	93
Early Containment Failure	0.7	5
Containment Bypass	0.2	2
Intact Containment	negligible	negligible
Total	**13.6**	**100**

[1]One person-rem = 0.01 person-Sv

G.2.2 Review of Entergy's Risk Estimates

Entergy's determination of off-site risk at PNPS is based on the following three major elements of analysis:

- The Level 1 and 2 risk models that form the bases for the 1992 IPE submittal (BECo 1992) and the external event analyses of the 1994 IPEEE submittal (BECo 1994)
- The major modifications to the IPE model that have been incorporated in the PNPS PSA, and

- The MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PSA model into off-site consequence measures.

Each of these analyses was reviewed to determine the acceptability of Entergy's risk estimates for the SAMA analysis, as summarized below.

The NRC staff's review of the PNPS IPE is described in an NRC report dated October 30, 1996 (NRC 1996). Based on a review of the IPE submittal and responses to RAIs, the NRC staff concluded that the IPE submittal met the intent of Generic Letter (GL) 88-20 (NRC 1988); that is, the applicant IPE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities. However, the NRC staff identified weaknesses in the human reliability analysis that would limit the use of the IPE for regulatory purposes other than GL 88-20.

No vulnerabilities were identified in the IPE. However, the applicant noted that a number of modifications to the plant had been previously made as a result of a safety enhancement program. These improvements included: provision of a hardened containment vent, addition of a fire water cross-tie, installation of a third diesel generator, installation of a backup nitrogen supply system, modifications to the automatic depressurization system (ADS), and implementation of Revision 4 of the BWROG emergency operating procedures (EOPs). The applicant also noted that the IPE insights resulted in improvements to procedures related to load shedding of AC buses on loss of DC supplies, and the use of fire water for containment sprays.

There have been two revisions to the IPE model since the 1992 IPE submittal, specifically, a 1995 revision to the IPE in response to NRC RAIs and a complete revision of the model in 2003 in response to the BWROG peer review. (The 1995 IPE revision was cited in the NRC IPE evaluation report, but was not reviewed in detail.) A comparison of internal events CDF between the 1995 IPE revision and the current PSA models indicates a decrease of about a factor of four in the total CDF (from 2.8×10^{-5} per year to 6.4×10^{-6} per year). Entergy attributes the decrease to improved plant performance, more realistic success criteria based on Modular Accident Analysis Program (MAAP) analyses, and improvements in data handling (Entergy 2006a). A comparison of the contributors to the total CDF indicates that some have increased while others have decreased. A summary listing of those changes that resulted in the greatest impact on the internal events CDF was provided in the ER and is summarized in Table G-3.

Table G-3. PNPS PSA Historical Summary

PSA Version	Summary of Changes from Prior Model	CDF (per year)
1992	IPE Submittal	5.85×10^{-5}
1995	IPE revised in response to NRC RAIs - removed high pressure coolant injection (HPCI) room cooling dependency - revised ADS success criteria - improved historical performance of HPCI/reactor core isolation cooling (RCIC) - eliminated low pressure injection after containment failure - added 3 recovery actions	2.84×10^{-5}
2003	Completely revised in response to BWROG peer review - updated failure rate, test and maintenance data - completely revised event trees - incorporated Revision 4 of BWROG EOPs - revised thermal hydraulic analysis to support success criteria - completely revised system fault tree models to reflect as-built configuration - completely revised operator error evaluation - completely revised internal flooding analysis - revised quantification to include evaluation of human error and recovery actions in cutsets	6.41×10^{-6}

The CDF value for the 1995 IPE revision (2.8×10^{-5} per year) is near the average of the CDF values reported in the IPEs for boiling water reactor (BWR) 3/4 plants. Figure 11.2 of NUREG-1560 shows that the IPE-based total internal events CDF for BWR 3/4 plants ranges from 9×10^{-8} to 8×10^{-5} per year, with an average CDF for the group of 2×10^{-5} per year (NRC 1997a). It is recognized that other plants have updated the values for CDF subsequent to the IPE submittals to reflect modeling and hardware changes. The current internal events CDF results for PNPS are comparable to or somewhat lower than that for other plants of similar vintage and characteristics.

The NRC staff considered the peer reviews performed for the PNPS PSA, and the potential impact of the review findings on the SAMA evaluation. In the ER, Entergy described the previous peer reviews, including the BWROG Peer Review of the 1992 IPE model conducted in March of 2000, and the independent consultant team review of the 2003 model. In response to an RAI, Entergy stated that the BWROG Peer Review included the 1992 IPE as well as the

changes incorporated in the 1995 revision (Entergy 2006b). The BWROG review concluded that the PNPS PSA can be effectively used to support applications after significant issues are addressed. Entergy stated that all major issues and observations from the BWROG Peer Review have been addressed and incorporated into the current PSA.

In response to an RAI, Entergy described steps taken to ensure the technical adequacy of the 2003 PSA model (Entergy 2006b). In addition to internal reviews, the 2003 model was reviewed by a team of independent consultants prior to issuance. This team reviewed the major elements of the PSA including: event trees, fault trees, human reliability, and the Level 2 model (Entergy 2006c). Recommended changes were examined with the review team and changes were made to the analysis and the report. Entergy stated that the remaining changes would not impact the conclusions of the SAMA analysis. In addition, subsequent to issuance, the 2003 PSA model was reviewed by an independent team of PSA analysts from Entergy South against the requirements of NEI-00-02, "Probabilistic Risk Assessment Peer Review Process Guidance." The team concluded that the 2003 model addressed the appropriate elements and that the update process was implemented in a manner that properly documents the model and supporting analysis.

Given that the PNPS internal events PSA model has been peer-reviewed and the peer review findings were either addressed or judged to have no adverse impact on the SAMA evaluation, and that Entergy has satisfactorily addressed NRC staff questions regarding the PSA, the NRC staff concludes that the internal events Level 1 PSA model is of sufficient quality to support the SAMA evaluation.

As indicated above, the current PNPS PSA does not include external events. In the absence of such an analysis, Entergy used the PNPS IPEEE to identify the highest risk accident sequences and the potential means of reducing the risk posed by those sequences, as discussed below.

The PNPS IPEEE was submitted in July 1994 (BECo 1994), in response to Supplement 4 of Generic Letter 88-20 (NRC 1991). The applicant did not identify any fundamental weaknesses or vulnerabilities to severe accident risk in regard to the external events related to seismic, fire, or other external events. In a letter dated October 1, 1999, the NRC staff concluded that the submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the applicant's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities (NRC 1999).

The PNPS IPEEE seismic analysis employed a seismic probabilistic risk assessment (PRA) with a simplified quantitative seismic containment performance analysis. The overall seismic

approach employed plant walkdowns by seismic review teams to identify components and structures to be modeled, development of seismic fragility values for components and structures, and risk quantification by fault tree analysis and integration of the plant logic model with the seismic hazard curve. A relay chatter evaluation was performed assuming that low ruggedness relays identified in the Unresolved Safety Issue (USI) A-46 program have been replaced. The applicant determined the seismic risk to be 5.82×10^{-5} per year and found the plant's high confidence low probability of failure (HCLPF) to be 0.25g peak ground acceleration [(PGA) the acceleration due to the gravitation force (g)] including random and human errors, and 0.32g PGA excluding the random and human error contributions. The applicant did not identify any seismic vulnerabilities; however, in the process of performing the analysis, several improvements were identified. These improvements involve structural modifications to the station blackout diesel, the main transformer, and bus A8. The structural improvements were subsequently implemented. The NRC review and closure of USI A-46 for PNPS are documented in a letter dated February 7, 2002 (NRC 2002).

In the ER, Entergy indicates that the seismic CDF was recently re-evaluated to be 3.22×10^{-5} per year. This updated CDF reflects a number of plant modifications and additional analyses performed subsequent to the original seismic PRA. These include elimination of room cooling requirements for HPCI, RCIC, Core Spray and residual heat removal (RHR) areas based on updated room heat up calculations, updated random component failure probabilities, and replacement of certain relays with seismically-rugged models.

In the ER, Entergy identified a number of conservatisms in the updated seismic model and concluded that, based on engineering judgement, a more realistic seismic CDF would be at least a factor of two lower than the revised seismic CDF, or about 1.61×10^{-5} per year. In response to an NRC staff RAI, Entergy presented the results of a sensitivity analysis in which the impact of removing two of these conservatisms was evaluated (Entergy 2006b). The sensitivity case included credit for reactor vessel depressurization via the safety relief valves (SRVs) (which was not included in the updated model due to nitrogen makeup system fragility concerns), and a more realistic estimate of the failure to align torus cooling or drywell sprays for containment decay heat removal. The result was a factor of 1.9 reduction in seismic CDF. Based on the information provided by the applicant, the NRC staff finds the use of a seismic CDF of 1.61×10^{-5} per year to be reasonable for the purposes of the SAMA analysis.

The PNPS IPEEE fire analysis employed a combination of a probabilistic risk analysis and Electric Power Research Institute's fire-induced vulnerability evaluation (FIVE) methodology. The evaluation was performed in four phases: (1) qualitative screening, (2) quantitative screening, (3) fire damage evaluation screening, and (4) fire scenario evaluation and quantification. Each phase focused on those fire areas that did not screen out in the prior

phases. The final phase involved using the IPE model for internal events to quantify the CDF resulting from a fire-initiating event. The CDF for each area was obtained by multiplying the frequency of a fire in a given fire area by the conditional core damage probability associated with that fire area including, where appropriate, the impact of fire suppression and fire propagation. In most cases, it was assumed that all equipment in the area was damaged by the fire. The potential impact on containment performance and isolation was evaluated following the core damage evaluation.

The total fire CDF was estimated to be 2.2×10^{-5} per year (BECo 1994). In the ER, Entergy indicates that the IPEEE fire CDF was subsequently revised to 1.9×10^{-5} per year based on use of updated equipment failure probabilities and unavailabilities. The applicant lists the following ten fire areas as the dominant contributors to the fire risk:

Fire Area	Area Description	CDF (per year)	
		IPEEE	Revised
13	Train B Switchgear Room	6.1×10^{-6}	6.9×10^{-6}
2B	Turbine Building Heater Bay	2.1×10^{-6}	2.7×10^{-6}
9	Vital Motor Generator Set Room	2.4×10^{-6}	2.4×10^{-6}
12	Train A Switchgear Room	3.1×10^{-6}	2.3×10^{-6}
3A	Train B reactor building closed cooling water/turbine building closed cooling water (RBCCW/TBCCW) Pump and Heat Exchanger Room	2.0×10^{-6}	1.3×10^{-6}
6	Control Room	1.6×10^{-6}	8.9×10^{-7}
1E	Reactor Building West. El. 21	9.7×10^{-7}	8.3×10^{-7}
7	Cable Spreading Room	9.5×10^{-7}	7.9×10^{-7}
26	Main Transformer	1.5×10^{-6}	7.6×10^{-7}
4A	Train A RBCCW/TBCCW Pump and Heat Exchanger Room	9.8×10^{-7}	3.0×10^{-7}
TOTAL		2.2×10^{-5}	1.9×10^{-5}

In the ER, Entergy states that the above CDF values are screening values and that a more realistic fire CDF may be about a factor of 3 lower (or 6.37×10^{-6} per year) based on the NRC staff estimate for another license renewal application. In response to an NRC staff RAI to justify the factor of 3 reduction for PNPS, Entergy stated that the fire analysis is conservative in

several areas, including: (1) omission of fire severity factors, (2) use of an older PSA model to obtain conditional core damage probabilities (CCDP), (3) no rigorous evaluation of plant operating procedures during fire events, and (4) use of a simple fire suppression analysis. Entergy presented the results of a sensitivity analysis which accounts for removal of two of the conservatisms mentioned above. The sensitivity case included fire severity factors for the dominant fire areas, and a requantified CCDP value for the transformer fire (Entergy 2006b). This reduces the fire CDF to 6.11×10^{-6} per year. Entergy noted that this fire CDF could be further reduced by addressing the remaining conservatisms listed above. Based on the results of the sensitivity analysis and the existence of remaining conservatisms, the NRC staff finds the use of a fire CDF of 6.37×10^{-6} per year to be reasonable for the purposes of the SAMA analysis.

The IPEEE analysis of high winds, floods and other external events followed the screening and evaluation approaches specified in Supplement 4 to GL 88-20 (NRC 1991) and did not identify any significant sequences or vulnerabilities (BECo 1994). Based on this result, Entergy concluded that these other external hazards would not be expected to impact the conclusions of the SAMA analysis and did not consider them further.

Based on the aforementioned results, the external events CDF is approximately 3.5 times the internal events CDF (based on a seismic CDF of 1.61×10^{-5} per year, a fire CDF of 6.37×10^{-6} per year, and an internal events CDF of 6.4×10^{-6} per year). Accordingly, the total CDF (from internal and external event would be approximately 4.5 times the internal events CDF. In revised SAMA analyses submitted in response to an RAI, Entergy multiplied the benefit that was derived from the internal events model by a factor of 5 to account for the combined contribution from internal and external events. The NRC staff agrees with the applicant's overall conclusion concerning the impact of external events and concludes that the applicant's use of a multiplier of 5 to account for external events is reasonable for the purposes of the SAMA evaluation.

The NRC staff reviewed the general process used by Entergy to translate the results of the Level 1 PSA into containment releases, as well as the results of the Level 2 analysis, as described in the ER and in response to NRC staff requests for additional information (Entergy 2006a, 2006b, and 2006c). The current Level 2 model utilizes a single CET containing both phenomenological and systemic events. The Level 1 core damage sequences are binned into one of 48 PDS bins based on binning criteria reflecting the state of the reactor, containment and cooling systems as the accident progresses. The PDSs provide the interface between the Level 1 and Level 2 analysis. CET nodes are evaluated using supporting fault trees and logic rules.

Entergy characterized the releases for the spectrum of possible radionuclide release scenarios using a set of 19 CAPBs based on the occurrence of core damage, the occurrence of vessel breach, primary system pressure at vessel breach, the location of containment failure, the timing of containment failure, and the occurrence of core-concrete interactions. The frequency of each CAPB was obtained by summing the frequency of the individual PDS accident progression CET endpoints binned into the CAPB. The release characteristics for each CAPB were obtained by frequency weighting the release characteristics for each PDS contributing to the CAPB. The source term release fractions for the PDS accident progression CET endpoints were estimated using a source term algorithm which separately accounts for in-vessel and ex-vessel fission product releases, and fission product removal mechanisms appropriate for the release pathways. The inputs to the source term algorithm were based on the results of plant-specific analyses of the dominant CET scenarios using the MAAP (MAAP4.04) computer program, and fission product decontamination factors from the analysis of the Peach Bottom plant reported in NUREG-1150 (NRC 1990). The CAPBs, their frequencies and release characteristics are presented in Tables E.1-9 and E.1-11 of the ER (Entergy 2006a).

In response to an RAI, Entergy provided the results of consequence analyses to support the process of frequency weighting the release fraction and other release characteristics of the individual PDS accident progression CET endpoints binned into each CAPB (Entergy 2006c). This analysis for CAPB-14, which is the dominant contributor to risk, indicates that the frequency weighting process leads to a slight (about 8 percent) over-estimate in population dose risk (person-rem per year) and a slight (about 6 percent) under-estimate in off-site economic cost risk (dollars per year). The process is considered acceptable by the NRC staff for the purposes of the SAMA analysis.

The NRC staff's review of the Level 2 IPE concluded that it addressed the most important severe accident phenomena normally associated with the Mark I containment type, and identified no significant problems or errors (NRC 1996). It should be noted, however, that the current Level 2 model is a complete revision to that of the IPE. The Level 2 PSA model was included in the independent consultant team review and the Entergy South review mentioned previously. Based on the NRC staff's review of the Level 2 methodology, and the fact that the Level 2 model was reviewed in more detail as part of an independent consultant review and a more recent Entergy South review, and updated to address the review findings, the NRC staff concludes that the Level 2 PSA provides an acceptable basis for evaluating the benefits associated with various SAMAs.

Even though Entergy used the MACCS2 code and scaled the reference BWR core inventory for PNPS plant-specific power level, the NRC staff requested that Entergy evaluate the impact on population dose if the core inventory were based on the plant-specific burnup and enrichment

(NRC 2006a). In response to the NRC staff's request, Entergy derived a best estimate inventory of long-lived isotopes (such as Sr-90, Cs-134 and Cs-137) from an ORIGEN calculation assuming 4.65 percent enrichment and average burnup based on expected fuel management practices. This resulted in an increase of approximately 25 percent in the inventories of the aforementioned radionuclides (Entergy 2006b), an increase in the total population dose from 13.6 to 14.6 person-rem per year, and an increase in the annual off-site economic risk monetary equivalent (discussed later) from $45,900 to $52,600 (Entergy 2006d). As part of their response, Entergy provided revised benefit estimates for each SAMA based on the revised inventory values. The revised benefit estimates are presented and discussed in Section G. 6.

The NRC staff reviewed the process used by Entergy to extend the containment performance (Level 2) portion of the PSA to an assessment of off-site consequences (essentially a Level 3 PSA). This included consideration of the source terms used to characterize fission product releases for the CAPBs and the major input assumptions used in the off-site consequence analyses. The MACCS2 code was utilized to estimate off-site consequences. The consequence results reported in the ER are based on use of MACCS2, Version 1.12. However, in response to an RAI, Entergy provided revised SAMA benefit estimates based on use of MACCS2, Version 1.13.1 (NRC 2006b). Plant-specific input to the code includes the source terms for each release category and the reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within a 50-mi radius for the year 2032, emergency evacuation modeling, and economic data. This information is provided in Attachment E to the ER (Entergy 2006a).

Entergy used site-specific meteorological data for the 2001 calendar year as input to the MACCS2 code. The data were collected from the on-site meteorological monitoring system and the Automated Surface Observatory system at Plymouth Airport. In response to an RAI, Entergy stated that it considered the year 2001 data to be the most current and complete set of data at the time of the SAMA analysis (Entergy 2006b). Missing data were obtained from either the lower tower or from estimates based on adjacent valid measurements of the missing hour. The NRC staff notes that previous SAMA analyses results have shown little sensitivity to year-to-year differences in meteorological data and concludes that the use of the 2001 meteorological data in the SAMA analysis is reasonable.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2032, based on the U.S. Census Bureau year 2000 population data together with Massachusetts and Rhode Island population projection data. The 2000 population was adjusted to account for transient population. These data were used to project county-level

resident populations to the year 2032. The NRC staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The licensee stated that the emergency evacuation model was modeled as a single evacuation zone extending out 10 mi from the plant. Entergy assumed that 100 percent of the population would move at an average speed of approximately 2.17 mi per hour with a delayed start time of 40 minutes (Entergy 2006a). This assumption is similar to the NUREG-1150 study (NRC 1990), which assumed evacuation of 99.5 percent of the population within the emergency planning zone. Sensitivity analyses were performed in which the evacuation delay time was increased to two hours, and the evacuation speed was decreased to 0.69 meters per second (1.5 mi per hour). The results were less than a two percent increase in the total population dose. The NRC staff notes that the evacuation speeds used in the SAMA analysis were based on an evacuation time estimate (ETE) study performed in 1998 (KLD 1998), and that an update of this study was completed in 2004 (KLD 2004). However, use of the later study would not impact the SAMA assessment. The average evacuation speeds from the updated study are essentially unchanged from the earlier study. Also, the slowest evacuation speed from the updated study (based on the most limiting combination of season, day of the week, time of day, and weather) is equal to the evacuation speed used in Entergy's low evacuation speed sensitivity analysis. The NRC staff concludes that the evacuation assumptions and analysis are reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data was provided from the 1997 Census of Agriculture (USDA 1998). These included the value of farm and non-farm wealth. Other data such as daily cost for an evacuated person, population relocation cost, daily cost for a person who is relocated, cost of farm and non-farm decontamination, and property depreciation were provided from the Code Manual for MACCS2 (NRC 1997c). The data from Sample Problem A values given in the MACCS2 code manual were adjusted using the consumer price index of 177.1. Information on regional crops were obtained from the New England Agricultural Statistics, 2001. Crops for Massachusetts and Rhode Island were mapped into the seven MACCS2 crop categories.

In the draft SEIS, the NRC staff reached a preliminary conclusion that the methodology used by Entergy to estimate the offsite consequences for PNPS provides an acceptable basis from which to proceed with an assessment of candidate SAMAs. A further assessment of the methodology was subsequently performed in response to a contention admitted as a results of a petition by Pilgrim Watch (PW) to intervene in the license renewal proceeding. As described in Section G.2.3, in view of small impact of the additional considerations raised in PW's contention on estimated SAMA benefits, the NRC staff reaffirms its original conclusion that the

methodology used by Entergy to estimate the offsite consequences for PNPS provides an acceptable basis from which to proceed with an assessment of candidate SAMAs.

G.2.3 Review of Issues Related to Pilgrim Watch Contention 3

On May 25, 2006, Pilgrim Watch (PW) filed a petition to intervene in the PNPS license renewal proceeding, challenging Entergy's SAMA analysis because it did not consider certain factors in its input data for the MACCS2 code. On October 16, 2006, the Atomic Safety Licensing Board (Board) admitted PW Contention 3 related to the SAMA analysis, and narrowed and amended the contention to read:

> *Applicant's SAMA analysis for the Pilgrim plant is deficient in that the input data concerning (1) evacuation times, (2) economic consequences, and (3) meteorological patterns are incorrect, resulting in incorrect conclusions about the costs versus benefits of possible mitigation alternatives, such that further analysis is called for.*

On May 17, 2007, Entergy filed a motion for summary disposition of Contention 3. The motion was supported by a technical report prepared by Washington Safety Management Solutions LLC (WSMS) entitled "Radiological Dispersion and Consequence Analysis Supporting Pilgrim Nuclear Power Station Severe Accident Mitigation Alternative Analysis" (WSMS 2007), and three affidavits. The WSMS report provides a listing of the various issues associated with each element of the contention, and includes additional sensitivity analyses and arguments to support resolution of each issue.

In assessing the overall impact of the various issues on the results of the SAMA analysis, the WSMS report noted that before any additional SAMAs would be identified as potentially cost-beneficial, the increase in the estimated benefits would need to be on the order of 100 percent (i.e., the benefits would need to double). Based on the analyses provided in the WSMS report, WSMS and Entergy concluded that the maximum benefit increase would only be about 4 percent and would not change the set of potentially cost-beneficial SAMAs identified in the SAMA analysis.

The NRC staff obtained the technical assistance of Sandia National Laboratory to determine if any of the issues raised in Contention 3 could change the conclusion of the SAMA analysis. In conducting this assessment, Sandia performed a comprehensive review of relevant documents and references. This included the ER, the draft SEIS, the petition to intervene, the Board ruling on Contention 3, and the motion for summary disposition and supporting documents.

Documents related to each of the three major areas of the contention were also reviewed, including the MACCS2 input decks for PNPS (Entergy 2006e), the 1998 and 2004 evacuation time estimate (ETE) studies for PNPS (KLD 1998 and KLD 2004), the supplemental economic analysis directly supporting the response to the contention (Enercon 2007), and literature related to sea breeze phenomena.

A summary of the staff's assessment of each of the potential issues related to Contention 3 is provided below.

Evacuation Times

The contention presents a number of issues concerning the evacuation time estimates and questions whether the most current data available was used. The contention suggests that the model assumes that the population is out of danger upon crossing the 16 km (10 mile) emergency planning zone (EPZ) boundary and does not account for individuals who cannot evacuate and must shelter. The contention suggests that the SAMA analysis did not use the most recent evacuation time estimates and that many of the assumptions used in the Pilgrim SAMA analysis are faulty. The contention suggests that the sensitivity analyses performed in Attachment E of the ER do not sufficiently address the delay in starting the evacuation or the speed of the evacuation. The contention also suggests that the July 4th celebration in Plymouth, Massachusetts, was not fully assessed in the evacuation time estimate.

Entergy provided detailed responses in the WSMS report for each of the specific ETE issues in Contention 3, except for the July 4th celebration. The report presents an itemized listing of the ETE issues, and supporting facts and sensitivity analyses that demonstrate that changes in the ETE would not affect the conclusions of the SAMA analysis. Based on review of the MACCS2 input files, the staff confirmed that the MACCS2 base case assumed the population was out of danger upon crossing the 32 km (20 mile) boundary, rather than the 10 mile boundary as claimed by PW. This is a realistic model of the likely situation. However, Sensitivity Case 4 in the WSMS report shows there is no noticeable increase in population dose even when evacuees were modeled as receiving dose to a distance of 64 km (40 miles).

The WSMS report also included sensitivity analyses which demonstrate that changes in evacuation times and sheltering strategies, such as sheltering those who can not evacuate, do not change the conclusions of the SAMA analysis. Sensitivity Case 5 in the WSMS report assumed everyone within the 16 km (10 mile) EPZ is sheltered in place. Sensitivity Case 6 assumed no one within 10 miles is evacuated or sheltered. As such, Sensitivity Case 6 bounds Case 5 and can be considered the limiting case for evacuation. Sensitivity Case 6 assessed the population as though they were continuing regular activities; thus Case 6 assesses any

effect of a shadow evacuation where a portion of the public may be in their vehicles. The results from Case 6 indicate that the population dose would increase by about 6 percent and that there is no change in the offsite economic cost risk (OECR). The reason for this result is that the economic impacts are dominated by effects in the 32 to 80 km (20 to 50 mile) high population area and by the late phase portions of the consequence modeling. Accordingly, mitigative measures within the 16 km (10 mile) EPZ have little impact on the total economic costs.

The WSMS report indicates that the SAMA analysis was performed in 2002 when the 1998 ETE study (KLD 1998) was the most current ETE study available. Based on review of the 2004 ETE study, the staff found the evacuation times to be very comparable to those of the 1998 ETE study. Sensitivity Cases 7a and 7b in the WSMS report increased the delay time to 6 hours and reduced the evacuation speed to 0.34 meters per second (0.76 miles per hour), which effectively bounds the results of the ETE studies. The assessment of additional delay and a slower evacuation would account for any additional time needed to notify the public, as well as effects of peak travel conditions. This case results in no increase to the OECR and is bounded by Sensitivity Case 6 (no evacuation or sheltering). Thus, the issues of whether Entergy used the most current ETE study, and assumptions on evacuation delay and speed in the SAMA analysis are fully addressed.

An issue concerning the July 4th celebration in Plymouth was not specifically addressed in the WSMS report. In researching this event, the staff found information on the number of people typically attending the event to be limited, although an attendance of 80,000 was reported in at least one local paper and confirmed by parade organizers and city planning as “a good guess”. Parade organizers estimate that the vast majority of attendees are residents of the area, thus they would already be included in the populations used in the MACCS2 calculations. There is no organized transportation, such as busing, to the event. To facilitate efficient traffic flow out of the area, at the conclusion of the festivities, all incoming traffic is closed off, and all lanes of roads that lead from the waterfront to Route 3 are established as westbound only. In the staff’s judgement the evacuation time for this once a year event would be bounded by Sensitivity Case 6, in which no one within 10 miles is evacuated or sheltered. The results of Sensitivity Cases 6 and 7 demonstrate that any impact on the ETE from this event would not change the conclusions of the SAMA analysis.

Economic Consequences

The contention states that the MACCS2 code models only the economic costs of mitigative actions and that any resulting loss of economic activity in Plymouth County or other neighboring

counties with significant tourism (including the Cape Cod area, travel to which is through Plymouth County) is not accounted for in the MACCS2 analysis.

The WSMS report provides a detailed discussion of the economic factors included in the MACCS2 analysis, along with results of a separate economic loss analysis in which the MACCS2 input parameters representing county-level values of non-farm property and the regional average non-farm wealth were modified to more completely account for the impacts to overall regional economic activity. The WSMS report notes that the MACCS2 model for PNPS accounts for a wide range of economic losses, including: food, lodging and lost income associated with evacuation and relocation; loss of crops and value of crops not grown; loss of use and lost return on property, including commercial and business property; depreciation associated with decontamination and interdiction; and value of condemned land and improvements. As part of interdiction costs, the MACCS2 model for PNPS assumed an annual depreciation rate (DPRATE) of 20 percent on property improvements to account for loss of value of buildings and other structures, and an expected annual rate of return (DSRATE) of 12 percent from land, buildings, equipment, etc. The staff notes that loss of business and personal income is estimated for periods of interdiction but not for people relocated from property that has been condemned. However, the results of the MACCS2 analysis for PNPS indicate that most of the contaminated land would be restored to use. Thus, the effect of lost income from condemned property would be small compared with the other costs and should not change the conclusions of the SAMA analysis.

The WSMS report presents the results of an additional economic loss analysis in which the MACCS2 input parameters representing county-level values of non-farm property (VNFRM) and the regional average non-farm wealth (VALWNF) were modified to more completely account for the impacts to the overall regional economic activity, including business and tourism. In the PNPS SAMA analysis, these MACCS2 parameters are based upon fixed reproducible tangible wealth – a measure of the durable goods that are owned in an area. In the additional analysis, these MACCS2 input parameter values were supplemented to also include a measure of the county economic output, termed the gross county product (GCP). The GCP values were derived from Gross Metropolitan Product data (analogous to the Gross State Product) for the year 2004 for all counties within the 50-mile ingestion planning zone, as described in a separate report by Enercon Services, Inc. (Enercon 2007). The resulting regional average non-farm wealth value is approximately $135K per person, which includes non-farm wealth (tangible wealth owned) of $84K per person and gross county product (economic output) of $51K per person based on one-year's worth of economic output.

The WSMS report notes that in the original MACCS2 analysis the county-level values of non-farm property (VNFRM) were based on 2002 data, but the regional average value of non-farm

wealth (VALWNF) was based on a projection of this parameter to the year 2032. The result was a regional average non-farm wealth value of approximately $189K per person. This original value (which does not include losses based on the GCP) is actually greater than the $135K per person derived through the separate analysis (which includes both tangible wealth owned and losses based on GCP per person) due to projection of the value to 2032 in the original analysis. The WSMS report included Sensitivity Case 8a, which shows that use of county-level values of non-farm property for 2004 and a regional average non-farm wealth value of $135K per person based on the 2004 data results in no change to population dose and a decrease in the OECR of 13 percent. The WSMS report also included Sensitivity Case 8b, which shows that use of county-level values of non-farm property for 2004 and a regional average non-farm wealth value of $189K per person based on the 2032 projection results in no change in population dose and an increase in the OECR of 2 percent.

The staff notes that the WSMS analysis does not fully account for business losses in two regards. First, loss of use is based on an expected rate of return, on a depreciation rate, and on the value of the property. In the SAMA analysis, the expected rate of return and depreciation rates were chosen to be 12 percent and 20 percent, respectively. Based on the equation used in MACCS2 to account for these two types of losses, only a fraction of the actual GCP per person (about 30 percent in the first year) is accounted for in the costs assigned during decontamination and interdiction. While the WSMS analysis does not fully account for business losses, the staff concludes that a full accounting of such losses would not change the conclusions of the SAMA analysis. The basis for this conclusion is that the WSMS sensitivity analyses exploring the use of different values for VALWNF and VNFRM resulted in a range of predicted OECR of only 15 percent.

The second area in which the WSMS analysis did not fully account for lost business income is for condemned property. Adding the per capita GCP to the value of personal wealth accounts for only one year's GCP in areas where the property is condemned even though the income associated with the land is lost permanently. However, as stated earlier, most of the contaminated land is recovered and tourism would be expected to return to these areas. Thus, this deficiency also has a minor effect on overall results and the staff concludes that it would not change the overall conclusions of the SAMA analysis.

Given the conservative values used for the regional average non-farm wealth (VALWNF) parameter in the original MACCS2 analysis, and the results of the additional economic loss analysis and sensitivity cases, the staff concludes that inclusion of economic impacts of lost business and tourism would have minimal effects on total costs of an accident (relative to those already considered in the ER), and that further adjustments to more precisely account for lost business and tourism would not likely change the overall conclusions of the SAMA analysis.

Meteorological Patterns

The contention presents a number of issues concerning the MACCS2 Gaussian plume model and the appropriateness of using this model to assess dispersion of radionuclide releases and related consequences. The contention suggests that the MACCS2 code has inherent limitations, including that it does not take into account changes in wind speed or direction either in time or space, it does not take into account terrain effects, and it cannot be used to estimate dispersion less than 100 meters from the plant. The contention suggests that sea breeze and coastal topography have an important impact on dose exposure. The contention further suggests that the meteorological data was insufficient because only two sources of data from a single year were used. It also suggests that proper analysis requires multiple years of data from multiple sources, and that accurate analysis would require installation of continuous recording meteorological instrumentation throughout the area.

The applicant provides detailed responses in the WSMS report for each of these specific meteorological and modeling issues. As stated in the report, the MACCS2 model does take into account changes in wind speed, stability class, and precipitation as a function of time, but does not take into account such changes as a function of space. The model accounts for the direction of the wind at the beginning of a plume release, but does not account for subsequent changes in wind direction for that particular plume segment. The MACCS2 plumes are governed by not only their wind direction, but the atmospheric stability, wind speed, and mixing layer height as well. Thus, selecting multiple weather sequences can provide a good approximation of plume activity throughout the atmosphere. As demonstrated in NUREG/CR-6853, "Comparison of Average Transport and Dispersion Among a Gaussian, a Two-Dimensional and a Three Dimensional Model" (NRC 2004b), the MACCS2 Gaussian plume model provides generally good agreement with more sophisticated codes for conditions relevant for the SAMA analysis, i.e., when average results are needed and for distances between the site boundary and a 50-mile radius from the plant. NUREG/CR-6853 presents a comparison of code results averaged over a set of hourly meteorological data representative of an entire year's meteorology. It is important to note that the site chosen for this comparison, while having relatively smooth topography, displays frequent low level nocturnal jets and occasional severe storms. Therefore, this comparison of annual average results is directly applicable to SAMA analyses where the MACCS2 code is used to evaluate offsite consequences using one complete year of site-specific meteorological data, representative of annual trends. Based on this detailed comparison, the staff concludes that use of more sophisticated codes and additional weather station data to account for changes as a function of space would not change offsite consequence results enough to alter the overall conclusions of the SAMA analysis.

The WSMS report discusses why the MACCS2 model yields generally good agreement with more sophisticated codes over the relatively flat terrain within the 50-mile region of the PNPS site, and provides rationale why the surface roughness length value of 10 cm used in the PNPS MACCS2 analysis produces conservative results. Sensitivity Case 3 presents an assessment of terrain changes relative to the point of release and shows that the offsite dose and economic costs are only minimally affected by local changes in terrain. Concerning the issue of coastal topography, the presence of significant topographical variations in the vicinity of the PNPS plant would cause increased mixing of the plume near the plant. The results of the MACCS2 analyses indicate that contamination effects in the outlying areas (with larger population centers) dominate the economic impacts rather than the close-in areas. With the larger population centers being further than 32 km (20 miles) from the plant, dispersion and atmospheric mixing will occur regardless of topographic differences near the plant. Thus, coastal topography would have limited effect on the overall results of the SAMA analysis. Also, dispersion at distances less than 100 meters from the plant is not significant to population dose since this region is encompassed by the Exclusion Area Boundary and has no permanent residents that could incur radiological exposure. Accordingly, issues related to the capabilities of MACCS2 to model dispersion within 100 meters of the plant are not relevant for the SAMA analysis.

The WSMS report provides a detailed discussion on the effects of sea breeze on population dose. The report characterizes the effect of sea breeze as generally beneficial in that it would tend to disperse the plume and decrease doses. The staff notes that a more disperse plume does not always imply a smaller population dose, since population dose depends on the trajectory and shape of the plume in relation to population centers. However, the staff concurs with the report's analyses and assertion that local sea breeze variations will be insignificant factors to population dose tens of miles away, and will have a limited impact in the calculation of regional population doses, particularly when sea breeze conditions are weighted by frequency of occurrence based on site conditions, time of day, and effective release elevation. Further, a sea breeze would generally confine the plume to the vicinity of the seacoast for an extended period of time rather than allowing it to travel inland. Because the plume would typically travel in a helical path rather than in a straight line, its progress along the coast line would be relatively slow. In the staff's view, the sea breeze would not likely persist long enough for the plume to reach a major population center (e.g., Boston). Since most of the population included in the assessment resides at distances greater than 32 km (20 miles) from the plant, population dose would generally be reduced under sea breeze conditions. Furthermore, a significant portion of the released materials would normally deposit over the sea rather than on land when a sea breeze occurs, which would further mitigate the consequences. Based on this, the staff concludes that further analysis of the effects of sea breeze would not change the overall conclusions of the SAMA analysis.

With regard to meteorological data, the contention suggests the data was insufficient because only two sources from a single year were used. It is suggested that proper analysis requires multiple years of data from multiple sources, and accurate analysis would require installation of continuous recording meteorological instrumentation throughout the area. As stated previously, for distances between the site boundary and 80 km (50 miles), the MACCS2 model provides generally good agreement with more sophisticated codes. Use of additional weather station data would not likely change the offsite consequence results enough to alter the overall conclusions of the SAMA analysis.

Summary

The WSMS report provides a detailed and substantial response to the issues of Contention 3. Based on review of the report and supporting documentation, and knowledge of the processes and modeling that is utilized in developing the supporting documentation (e.g., MACCS2 model) the staff with the assistance of its contractor, concludes that the issues related to Contention 3 would have only a small impact on estimated SAMA benefits, and would not alter the overall conclusions of the SAMA analysis. Accordingly, the NRC staff reaffirms its original conclusion that the methodology used by Entergy to estimate the offsite consequences for PNPS provides an acceptable basis from which to proceed with an assessment of candidate SAMAs.

G.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by Entergy are discussed in this section.

G.3.1 Process for Identifying Potential Plant Improvements

Entergy's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- Review of the most significant basic events from the current, plant-specific PSA;
- Review of potential plant improvements identified in the PNPS IPE and IPEEE;
- Review of Phase II SAMAs from license renewal applications for six other U.S. nuclear sites; and

- Review of other NRC and industry documentation discussing potential plant improvements, e.g., NUREG-1560.

Based on this process, an initial set of 281 candidate SAMAs, referred to as Phase I SAMAs, was identified. In Phase I of the evaluation, Entergy performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- The SAMA is not applicable at PNPS due to design differences,
- The SAMA has already been implemented at PNPS, or
- The SAMA is similar in nature and could be combined with another SAMA candidate.

Based on this screening, 222 SAMAs were eliminated leaving 59 for further evaluation. The remaining SAMAs, referred to as Phase II SAMAs, are listed in Table E.2-1 of the ER (Entergy 2006a). In Phase II, a detailed evaluation was performed for each of the 59 remaining SAMA candidates, as discussed in Sections G.4 and G.6 below. To account for the potential impact of external events, the estimated benefits based on internal events were multiplied by a factor of 5, as discussed previously.

G.3.2 Review of Entergy's Process

Entergy's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events. The initial list of SAMAs generally addressed the accident sequences considered to be important to CDF from functional, initiating event, and risk reduction worth (RRW) perspectives at PNPS, and included selected SAMAs from prior SAMA analyses for other plants.

Entergy provided a tabular listing of the PSA basic events sorted according to their RRW (Entergy 2006a). SAMAs impacting these basic events would have the greatest potential for reducing risk. Entergy used a RRW cutoff of 1.005, which corresponds to about a one-half percent change in CDF given 100-percent reliability of the SAMA. This equates to a benefit of approximately $20,000 (after the benefits have been multiplied to account for external events). Entergy correlated the basic events with highest risk importance in the Level 1 PSA with the SAMAs evaluated in Phase I or Phase II, and showed that all of the significant basic events are addressed by one or more SAMAs (Entergy 2006a).

For a number of the Phase II SAMAs listed in the ER, the information provided did not sufficiently describe the proposed modification. Therefore, the NRC staff asked the applicant to provide more detailed descriptions of the modifications for several of the Phase II SAMAs candidates (NRC 2006a). In response to the RAI, Entergy provided the requested information (Entergy 2006b).

The NRC staff questioned the ability of some of the candidate SAMAs to accomplish their intended objectives (NRC 2006a). In response to the RAIs, Entergy addressed the NRC staff's concerns by either re-evaluating the existing SAMA using revised modeling assumptions, or by evaluating an alternative (additional) SAMA (Entergy 2006b). This is discussed further in Section G.6.2.

The NRC staff also questioned Entergy about lower cost alternatives to some of the SAMAs evaluated, including the use of a redundant diesel fire pump for core injection, the use of a portable generator to power the battery chargers, and the use of a portable generator to provide alternate DC power feeds (NRC 2006a). In response to the RAIs, Entergy addressed the suggested lower cost alternatives, some of which are covered by an existing procedure, or are addressed by a new SAMA (Entergy 2006b). This is discussed further in Section G.6.2.

In the ER, Entergy states that in both the IPE and IPEEE, several enhancements related to severe accident insights were recommended and implemented, and that these enhancements were included in the comprehensive list of Phase I SAMA candidates. However, the list of Phase I SAMA candidates was not provided in the ER. Therefore, the NRC staff requested that the applicant indicate whether the enhancement has been implemented, and whether credit for the enhancement is taken in the current PSA model (used for the SAMA analysis) (NRC 2006a). In response to the RAI, Entergy indicated that Phase I SAMAs 248 through 281 include enhancements recommended in the IPE and IPEEE. Entergy indicated that most of these SAMAs have been implemented. Those enhancements that have not been implemented were retained for consideration during Phase II.

Based on this information, the NRC staff concludes that the set of SAMAs evaluated in the ER, together with those identified in response to NRC staff RAIs, addresses the major contributors to internal event CDF.

In response to an NRC staff RAI, Entergy reviewed the list of important seismic faults identified in the IPEEE to identify potential SAMAs (Entergy 2006b). Most of the important contributors are assumed correlated failures of relatively rugged structures or components (seismic capacities greater than 1.0 g). The only component (other than piping) with a median capacity of less than 1.0 g is the Emergency Diesel Generator (EDG) building, but this is not in the list of important components due to the presence of the SBO diesel. As a result of this review,

Entergy did not identify any candidate SAMAs for further evaluation. Based on the applicant's IPEEE efforts to identify and address seismic outliers and the expected cost associated with further seismic risk analysis and potential plant modifications, the NRC staff concludes that the opportunity for seismic-related SAMAs has been adequately explored and that there are no cost-beneficial, seismic-related SAMA candidates.

Entergy also did not identify PNPS-specific candidate SAMAs for fire events. The fire risk at PNPS is dominated by ten fire areas, the largest contributor being the Train B switchgear room. The NRC staff asked the applicant to explain what measures were taken to further reduce risk and why the fire risk cannot be further reduced in a cost effective manner (NRC 2006a). In response to this request, Entergy stated that five fire areas from the revised IPEEE produced fire CDF contributions in excess of 1×10^{-6} per year, and that these were due to modeling conservatism. Application of the severity factors from the Electric Power Institute's Fire PRA Implementation Guide (EPRI 1995), as discussed previously, reduced the individual CDF contributions for all fire areas to below the 1×10^{-6} per year threshold. Therefore, modifications to further reduce the fire CDF are unlikely to be cost beneficial (Entergy 2006b). Entergy also stated that the risk significant fire areas are equipped with a fire detection system that alarms in the control room, and that several of the areas are equipped with a fire suppression system. Therefore, no cost-effective hardware changes were identified. As stated earlier, other external hazards (high winds, external floods, and transportation and nearby facility accidents) are below the threshold screening frequency and are not expected to impact the conclusions of the SAMA analysis; therefore, no plant modifications were identified for these external hazards. The NRC staff concludes that the applicant's rationale for eliminating these enhancements from further consideration is reasonable.

The NRC staff notes that the set of SAMAs submitted is not all-inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the NRC staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

The NRC staff concludes that Entergy used a systematic and comprehensive process for identifying potential plant improvements for PNPS, and that the set of potential plant improvements identified by Entergy is reasonably comprehensive and therefore acceptable. This search included reviewing insights from the plant-specific risk studies and reviewing plant improvements considered in previous SAMA analyses. While explicit treatment of external events in the SAMA identification process was limited, it is recognized that the prior implementation of plant modifications for seismic events and the absence of external event

vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose.

G.4 Risk Reduction Potential of Plant Improvements

Entergy evaluated the risk-reduction potential of the 59 remaining SAMAs (Phase II) that were applicable to PNPS. The majority of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

Entergy used model re-quantification to determine the potential benefits. The CDF and population dose reductions were estimated using the PNPS PSA model. The changes made to the model to quantify the impact of SAMAs are detailed in Section E.2.3 of Attachment E to the ER (Entergy 2006a). Table G-4 lists the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. The estimated benefits reported in Table G-4 reflect the combined benefit in both internal and external events, as well as a number of changes to the analysis methodology subsequent to the ER. The determination of the benefits for the various SAMAs is further discussed in Section G.6.

The NRC staff questioned the assumptions used in evaluating the benefits or risk reduction estimates of certain SAMAs provided in the ER (NRC 2006a). SAMAs 002 and 019, both concerning installing a filtered vent, indicated no reduction in off-site dose. In response to an unrelated RAI, Entergy stated that the original values for these SAMAs were in error, and provided revised results along with more details of the analysis of the benefits (Entergy 2006b). In response to a subsequent request for clarification, Entergy provided additional information that resolved the staff's concerns (Entergy 2006c).

For SAMA 53, control containment venting within a narrow band of pressure, the staff noted that the analysis assumptions were not directly related to the impact of the SAMA on CDF. In response to an RAI and a subsequent request for clarification, Entergy described a new analysis that appropriately considered the impact of the SAMA and resulted in an increase in the assessed benefit (Entergy 2006b, 2006c).

For SAMA 27, modification for improving DC bus reliability, the staff noted that the proposed modification was identified to address the loss of DC bus initiators which contribute almost 50 percent to the CDF. However, SAMA 27 was estimated to reduce CDF by less than 5 percent.

In response to an RAI and subsequent request for clarification, Entergy reevaluated the benefit by eliminating the occurrence of a loss of a 125 volt DC (VDC) bus initiator which resulted in a 24 percent reduction in CDF rather than the 5 percent reduction reported in the ER (Entergy 2006b).

The NRC staff has reviewed Entergy's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the NRC staff based its estimates of averted risk for the various SAMAs on Entergy's risk reduction estimates.

G.5 Cost Impacts of Candidate Plant Improvements

Entergy estimated the costs of implementing the 59 candidate SAMAs through the application of engineering judgment and use of other licensees' estimates for similar improvements. The cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include contingency costs associated with unforeseen implementation obstacles. The cost estimates provided in the ER did not account for inflation. For those SAMAs whose implementation costs were originally developed for severe accident mitigation design alternative analyses (i.e., during the design phase of the plant), additional costs associated with performing design modifications to the existing plant were not included.

The NRC staff reviewed the bases for the applicant's cost estimates (presented in Section E.2.3 of Attachment E to the ER). For certain improvements, the NRC staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The NRC staff noted that several of the cost estimates provided by the applicant were drawn from previous SAMA analyses for a dual-unit site. As such, the cost estimates reflect implementation for two units. Also, some of the cost estimates provided (as taken from other SAMA analyses) are specific to a plant's design, such as the number of valves or batteries that would need to be replaced. Therefore, the NRC staff asked the applicant to provide appropriate cost estimates that are specific to PNPS (NRC 2006a). In response to the staff's request, Entergy provided revised cost estimates for several SAMAs (Entergy 2006b). For those cost estimates that were taken from a dual-unit SAMA analysis, Entergy reduced the estimated costs by half. For those SAMAs that required a more plant-specific cost estimate, Entergy provided new cost estimates along with a brief explanation of what the cost estimates include. Revision of these cost estimates had no impact on the original conclusions (Entergy 2006b). The staff reviewed the costs and subsequent cost revisions and found them to be

reasonable, and generally consistent with estimates provided in support of other plants' analyses.

The NRC staff concludes that the cost estimates provided by Entergy are sufficient and appropriate for use in the SAMA evaluation.

Table G-4. SAMA Cost/Benefit Screening Analysis for PNPS [(a)]

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [(b)]	Total Benefit Using 3% Discount Rate ($) [(b)]	Cost ($)
		CDF	Population Dose			
Decay Heat Removal Capability – Torus Cooling	Completely eliminate loss of torus cooling mode of RHR system events	5	5	234,000	319,000	
1 - Install an independent method of suppression pool cooling						5,800,000
14 - Dedicated suppression pool cooling						5,800,000
Decay Heat Removal Capability – Drywell Spray	Completely eliminate loss of drywell spray mode of RHR system events	5	5	236,000	322,000	5,800,000
9 - Install a passive containment spray system						
Filtered Vent [(c)]	Reduce successful torus venting accident progression source terms by a factor of two	0	18	872,000	1,220,000	
2 - Install a filtered containment vent to provide fission product scrubbing.						3,000,000
Option 1: Gravel bed filter						
Option 2: Multiple venturi scrubber						
19 - Install a filtered vent						3,000,000
Containment Vent for ATWS Decay Heat Removal	Completely eliminate ATWS sequences associated with containment bypass	1	1	57,000	79,000	
3 - Install a containment vent large enough to remove ATWS decay heat						>2,000,000
47 - Install an ATWS sized vent						>2,000,000

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Molten Core Debris Removal	Completely eliminate containment failures due to core-concrete interaction (not including liner failure)	0	49	2,410,000	3,360,000	
4 - Create a large concrete crucible with heat removal potential under the base mat to contain molten core debris						>100,000,000
5 - Install a core retention device inside the reactor pedestal area						19,000,000
8 - Create a core melt source reduction system						>5,000,000
23 - Install a reactor cavity flooding system						8,750,000
Flooding the Rubble Bed	Completely eliminate dry core-concrete interactions	0	23	1,125,000	1,570,000	
22 - Provide a means of flooding the rubble bed on the drywell floor						2,500,000
Base Mat Melt-Through	Completely eliminate containment failures due to base mat melt-through	0	1	27,000	38,000	
11 - Increase the depth of the concrete base mat or use an alternative concrete material to ensure melt-through does not occur						>5,000,000
Reactor Vessel Exterior Cooling	Reduce probability of vessel failure by a factor of two	0	~0	5,000	8,000	
12 - Provide a reactor vessel exterior cooling system						2,500,000

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Drywell Head Flooding	Completely eliminate drywell head failures due to high temperature	~0	~0	0	0	
						>1,000,000
6 - Provide modification for flooding the drywell head						
						12,000,000
18 - Increase the temperature margin for seals						
						>1,000,000
20 - Provide a method of drywell head flooding						
Reactor Building Effectiveness	Reactor building is available for all accidents, i.e., completely eliminate reactor building failures	0	1	59,000	83,000	
						>2,500,000
7 - Enhance fire protection system and standby gas treatment system (SGTS) hardware and procedures						
						>2,000,000
13 - Construct a building connected to primary containment that is maintained at a vacuum						
						>2,500,000
21 - Use alternate method of reactor building spray						

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Strengthen Containment	Completely eliminate all energetic containment failure modes direct containment heating (DCH), steam explosions, late over-pressurization)	0	26	1,150,000	1,610,000	
10 - Strengthen primary and secondary containment						12,000,000
15 - Create a larger volume in containment						8,000,000
16 - Increase containment pressure capability (sufficient pressure to withstand severe accidents)						12,000,000
24 - Add ribbing to the containment shell						12,000,000
Vacuum Breakers	Completely eliminate vacuum breaker failures	~0	~0	0	0	>1,000,000
17 - Install improved vacuum breakers (redundant valves in each line)						
DC Power	Increase time available to recover off-site power (before HPCI and RCIC are lost) from 14 to 24 hours during SBO scenarios	1	3	133,000	183,000	
25 - Provide additional DC battery capacity						500,000
26 - Use fuel cells instead of lead-acid batteries						>1,000,000[d]

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
28 - Provide 16-hour SBO injection						500,000
33 - Install fuel cells						>1,000,000[d]
35 - Extended SBO provisions						500,000
Improved DC System						
27 - Modification for improving DC bus reliability [e]	Completely eliminate loss of 125 VDC bus B initiator	24	16	839,000	1,130,000	1,950,000
34 - Enhance procedures to make use of DC bus cross-ties	**Completely eliminate failures of DC buses D16 and D17**	**5**	**2**	**110,000**	**145,000**	**13,000**
Dedicated DC Power and Additional Batteries and Divisions	Completely eliminate loss of DC bus D17 and loss of one division of DC power events	24	16	833,000	1,120,000	
31 - Add a dedicated DC power supply						3,000,000
32 - Install additional batteries or divisions						3,000,000
Improved AC Power System	**Completely eliminate loss of motor control centers (MCCs) B17, B18, and B15 events**	**11**	**8**	**427,000**	**577,000**	
30 - Enhance procedures to make use of AC bus cross-ties						**146,000**
Alternate Pump Power Source	Completely eliminate SBO diesel generator failures	2	5	248,000	342,000	
29 - Provide an alternate pump power source						>1,000,000[d]

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Locate RHR Inside Containment	Completely eliminate all RHR interface system loss-of-coolant accident (ISLOCA) sequences	<1	~0	8,000	11,000	
36 - Locate RHR inside containment						>500,000
ISLOCA	Completely eliminate all ISLOCA events	1	1	26,000	35,000	
37 - Increase frequency of valve leak testing						100,000
Main Stream Isolation Valve (MSIV) Design	Completely eliminate containment bypass due to MSIV leakage failures	~0	~0	0	0	
38 - Improve MSIV design						n/a[d]
Diesel to Condensate Storage Tank (CST) Makeup Pumps	Completely eliminate switchover from CST to torus failures	~0	~0	0	0	
39 - Install an independent diesel for the CST makeup pumps						135,000
High Pressure Injection System	HPCI system is always available	3	2	103,000	137,000	
40 - Provide an additional high pressure injection pump with independent diesel						>1,000,000[d]
41 - Install independent AC high pressure injection system						>1,000,000[d]
42 - Install a passive high pressure system						>1,000,000[d]
44 - Install an additional active high pressure system						>1,000,000[d]
45 - Add a diverse injection system						>1,000,000[d]

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Improve the Reliability of High Pressure Injection System	Reduce HPCI system failure probability by a factor of 3	2	1	69,000	92,000	
43 - Improved high pressure systems						>1,000,000[d]
SRVs Reseat	Completely eliminate stuck open SRV events	2	1	48,000	64,000	
46 - Increase SRV reseat reliability						1,800,000[d]
Reliability of SRVs	Completely eliminate SRVs failing to open when required by reactor pressure vessel overpressure conditions	1	1	32,000	43,000	
49 - Increase reliability of SRVs by adding signals to open them automatically						>1,500,000
Improved SRV Design	Completely eliminate SRVs failing to open during reactor pressure vessel (RPV) depressurization events	5	3	173,000	232,000	
50 - Improve SRV design						1,500,000[d]
Diversity of Explosive Valves	Completely eliminate common cause failures of standby liquid control (SLC) explosive valves	~0	~0	0	0	
48 - Diversify explosive valve operation						>200,000
Self-Cooled Emergency Core Cooling System (ECCS) Pump Seals	Completely eliminate RHR pump failures	<1	1	30,000	41,000	
51 - Provide self-cooled ECCS pump seals						>200,000
Large Break LOCA	Completely eliminate large break LOCAs	~0	~0	1,000	1,000	
52 - Provide digital large break LOCA protection						>100,000

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Controlled Containment Venting	**Credit continued vessel injection from low pressure core injection (LPCI) or core spray for sequences with successful venting and failure of alternative injection systems after venting**	**3**	**5**	**242,000**	**334,000**	
53 - Control containment venting within a narrow band of pressure [f]						**300,000**
ECCS Low Pressure Interlock	Completely eliminate sensor failure, low pressure permissive logic failure, and miscalibration events	<1	1	24,000	32,000	
54 - Install a bypass switch to bypass the low reactor pressure interlocks of LPCI or core spray injection valves						1,000,000
Improve the Reliability of salt service water (SSW) and RBCCW Pumps	Completely eliminate common cause failures of SSW and RBCCW pumps	4	7	335,000	460,000	
55 - Increase the reliability of SSW and RBCCW pumps						>5,000,000
Redundant DC Power Supplies to Direct Torus Vent (DTV) Valves	**Completely eliminate failures of DTV valves AO-5042B and AO-5025 due to failure of DC power supply**	**9**	**3**	**200,000**	**265,000**	
56 - Provide redundant DC power supplies to DTV valves						**112,000**
Proceduralize the Use of Diesel Fire Pump hydro turbine	**Completely eliminate loss of off-site power (LOOP) and failure of either EDG A or fuel oil transfer pump P-141 events**	**2**	**3**	**157,000**	**215,000**	
57 - Proceduralize use of the diesel fire pump hydro turbine in the event of EDG A failure or unavailability						**26,000**

Table G-4. (contd)

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 7% Discount Rate ($) [b]	Total Benefit Using 3% Discount Rate ($) [b]	Cost ($)
		CDF	Population Dose			
Proceduralize Alignment of Bus B3 to Feed Bus B1 Loads of Bus B4 to Bus B2	**Completely eliminate loss of 4.16 kilovolts (kV) bus A5 events**	**5**	**3**	**175,000**	**237,000**	
58 - Proceduralize the operator action to feed B1 loads via B3 when A5 is unavailable post-trip. Similarly, feed B2 loads via B4 when A6 is unavailable post-trip						**50,000**
Redundant Path from Fire Water Pump Discharge to LPCI Loops A and B Cross-Tie	Completely eliminate failures to inject fire water into LPCI loops A and B cross-tie	9	17	846,000	1,170,000	
59 - Provide redundant path from fire protection pump discharge to LPCI loops A and B cross-tie						1,960,000

(a) SAMAs in bold are potentially cost-beneficial
(b) Estimated benefits taken from a revised assessment provided in response to RAI 3c (Entergy 2006b). This assessment is based on: (1) a multiplier of 5 to account for potential risk reduction in both internal and external events, (2) revised core inventories to reflect expect fuel management practices at PNPS, and (3) use of Version 1.13.1 of the MACCS2 code.
(c) Due to an inadvertent use of baseline benefits rather than reduced benefits in the ER, the values for this analysis case have been corrected (Entergy 2006b).
(d) Estimated costs reflect revised values provided in response to RAI 6.b (Entergy 2006b)
(e) Estimated costs reflect revised values provided in response to RAI 5.e (Entergy 2006b)
(f) Estimated benefits reflect revised values provided in response to RAI 6.d (Entergy 2006c)

G.6 Cost-Benefit Comparison

Entergy's cost-benefit analysis and the NRC staff's review are described in the following sections.

G.6.1 Entergy's Evaluation

The methodology used by Entergy was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997a). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE + AOSC) - COE

where,

APE = present value of averted public exposure ($)
AOC = present value of averted off-site property damage costs ($)
AOE = present value of averted occupational exposure costs ($)
AOSC = present value of averted on-site costs ($)
COE = cost of enhancement ($).

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. Entergy's derivation of each of the associated costs is summarized below.

NUREG/BR-0058 has recently been revised to reflect the agency's policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed, one at 3 percent and one at 7 percent (NRC 2004a). Entergy provided both sets of estimates (Entergy 2006a).

<u>Averted Public Exposure (APE) Costs</u>

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/per year)
x monetary equivalent of unit dose ($2000 per person-rem)
x present value conversion factor (10.76 based on a 20-year period with a 7-percent discount rate).

As stated in NUREG/BR-0184 (NRC 1997a), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, which assumes elimination of all severe accidents due to internal events, Entergy calculated an APE of approximately $293,000 for the 20-year license renewal period.

Averted Off-site Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction

x off-site economic costs associated with a severe accident (on a per-event basis)
x present value conversion factor.

For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, Entergy calculated an annual off-site economic risk of about $45,900 based on the Level 3 risk analysis. This results in a discounted value of approximately $494,000 for the 20-year license renewal period.

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor.

Entergy derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997a). Best estimate values provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2000 per person-rem, a real discount rate of 7 percent, and a time

period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, Entergy calculated an AOE of approximately $2,400 for the 20-year license renewal period.

Averted On-site Costs

Averted on-site costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Entergy derived the values for AOSC based on information provided in Section 5.7.6 of NUREG/BR-0184, the regulatory analysis handbook (NRC 1997a).

Entergy divided this cost element into two parts – the on-site cleanup and decontamination cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction
x present value of cleanup costs per core damage event
x present value conversion factor.

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be $\$1.5 \times 10^9$ (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, Entergy calculated an ACC of approximately $74,000 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction
x present value of replacement power for a single event
x factor to account for remaining service years for which replacement power is required
x reactor power scaling factor

For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, Entergy calculated an RPC of approximately $51,000 for the 20-year license renewal period.

Using the above equations, Entergy estimated the total present dollar value equivalent associated with completely eliminating severe accidents from internal events at PNPS to be about $914,000. Use of a multiplier of 5 to account for external events increases the value to $4.6M and represents the dollar value associated with completely eliminating all internal and external event severe accident risk at PNPS.

Entergy's Results

If the implementation costs for a candidate SAMA exceeded the calculated benefit, the SAMA was considered not to be cost-beneficial. In the baseline analysis contained in the ER (using a 7 percent discount rate, and considering the combined impact of both external events and uncertainties), Entergy identified five potentially cost-beneficial SAMAs. The potentially cost-beneficial SAMAs are:

- SAMA 30 – install key-locked control switches to enable AC bus cross-ties and modify procedures to enhance the reliability of the AC power system.
- SAMA 34 – modify plant procedures to use DC bus cross-ties to enhance the reliability of the DC power system.
- SAMA 56 – install additional fuses in panel C7 to enable the DTV valve function during loss of containment heat removal accident sequences.
- SAMA 57 – modify plant procedures to allow use of the diesel fire pump hydro turbine in the event that EDG A fails or fuel oil transfer pump P-141A is unavailable.
- SAMA 58 – modify plant procedures to allow alternately feeding B1 loads via B3 when A3 is available, and alternately feeding B2 loads via B4 when A4 is available.

Entergy performed additional analyses to evaluate the impact of alternative discount rates and remaining plant life on the results of the SAMA assessment. No additional SAMA candidates were determined to be potentially cost-beneficial (Entergy 2006a). In response to an RAI, Entergy provided a revised assessment based on modified multipliers and a separate accounting of uncertainties. The revised assessment resulted in identification of the same potentially cost-beneficial SAMAs. However, in response to additional NRC staff inquiries regarding estimated benefits for certain SAMAs and lower cost alternatives, Entergy identified two additional potentially cost-beneficial SAMAs. The potentially cost-beneficial SAMAs, and Entergy's plans for further evaluation of these SAMAs are discussed in more detail in Section G.6.2.

G.6.2 Review of Entergy's Cost-Benefit Evaluation

The cost-benefit analysis performed by Entergy was based primarily on NUREG/BR-0184 (NRC 1997a) and was executed consistent with this guidance. In the ER, Entergy evaluated the reduction in risk for each SAMA in the context of an upper bound analysis which combined the impact of seismic and fire external events with the impact of uncertainty. The impact of external events was considered by applying a multiplier of 3.51 to the estimated SAMA benefits in internal events [(seismic CDF of 1.61×10^{-5} per year + fire CDF of 6.37×10^{-6} per year) / (internal events CDF of 6.4×10^{-6} per year)]. The impact of uncertainties was considered by applying an additional multiplier of 1.62, which represents the ratio of the 95th percentile CDF to the mean CDF for internal events. Entergy bounded the combined impact of external events and uncertainties by applying a multiplier of 6 to the estimated SAMA benefits in internal events.

In an RAI, the NRC staff requested that the baseline evaluation be revised to include only the impact of internal and external events (without uncertainties), and that the impact of analysis uncertainties on the SAMA evaluation results be considered separately (NRC 2006a). The NRC staff also pointed out that the external events multiplier should be at least 4.51 (to account for internal events CDF plus external events CDF) rather than 3.51. In response to the RAI, Entergy revised the baseline benefit values by applying a multiplier of 5 to the estimated SAMA benefits in internal events to account for potential SAMA benefits in both internal and external events (Entergy 2006b). Additionally, Entergy revised the consequence analyses on which the benefit estimates are based to account for fuel enrichment and burnup expected during the period of extended operation, and use of a later version of the MACCS2 code.
As a result of the revised baseline analysis (using a multiplier of 5 and a 7 percent real discount rate), Entergy found that the same five SAMA candidates (mentioned above) remained potentially cost-beneficial. No additional SAMA candidates were found to be potentially cost-beneficial. When benefits were evaluated using a 3 percent discount rate, as recommended in NUREG/BR-0058, Revision 4 (NRC 2004b), no additional SAMAs were determined to be potentially cost-beneficial. Entergy considered the impact that possible increases in benefits from analysis uncertainties would have on the results of the SAMA assessment. In the ER, Entergy presents the results of an uncertainty analysis of the internal events CDF which indicates that the 95th percentile value is a factor of 1.62 times the mean CDF. Entergy re-examined the Phase II SAMAs to determine if any would be potentially cost beneficial if the revised baseline benefits were increased by an additional factor of 1.6. No additional SAMAs were identified.

In the ER, Entergy noted that the SAMA analysis is conservative and does not estimate all of the benefits or all of the costs of a SAMA. Therefore, Entergy has submitted the five potentially cost-beneficial SAMAs for engineering project cost-benefit analysis.

The NRC staff questioned the ability of some of the candidate SAMAs identified in the ER to accomplish their intended objectives (NRC 2006a). In response to the RAIs, Entergy addressed each SAMA and provided revised or new evaluations as discussed below.

- Phase II SAMA 27, modification for improving DC bus reliability, is the only SAMA listed in the ER that directly addresses improving DC system reliability. Loss of DC bus initiators contribute almost 50 percent of the internal events CDF. The CDF reduction from implementation of SAMA 27 was estimated to be less than 5 percent. The staff asked the applicant to discuss the loss of DC initiators in more detail, and the potential for other modifications to reduce this contribution to CDF. In response, Entergy provided additional information regarding the dominant contributors to loss of DC sequences, and the simplifications made in the original SAMA assessment, in view of the fact that PNPS has had no occurrences of loss of a DC bus in its operating history. Entergy reevaluated the benefits of SAMA 27 by postulating that it would completely eliminate the occurrence of a loss of a 125 VDC bus B initiator. This resulted in a 24 percent reduction in CDF, a 16 percent reduction in population dose, and a benefit (including the impact of uncertainties) of approximately $1.3 million. However, Entergy estimated the cost of implementing this SAMA to be almost $2 million (Entergy 2006b). Therefore, SAMA 27 would not be cost-beneficial.

  The NRC staff notes that SAMA 27 involves improving injection capability by adding a capability for auto-transfer of AC bus control power to a standby DC power source upon loss of the normal DC source. The associated modifications are substantial, and the implementation costs are therefore significant. A lower cost alternative, involving enhancing procedures to make use of DC bus cross-ties to improve DC power reliability, was evaluated as SAMA 34 and found to be potentially cost-beneficial, as mentioned above. In view of the large contribution to risk from DC power related events, additional lower cost alternatives for improving DC power were also pursued, as discussed below.

- Phase II SAMA 53, control containment venting within a narrow pressure band, was identified as a potential SAMA to further reduce the risk contribution from basic event CIV-XHE-FO-DTV, operator fails to vent containment using the direct torus vent. The NRC staff questioned both the risk reduction estimate provided by Entergy for this SAMA, as well as the whether an alternative SAMA to create a passive vent system might be cost-beneficial.

  In the ER, Entergy estimated the benefit of controlling containment venting within a narrow pressure band, by reducing the probability of operator failure to vent, by a factor of 3. The NRC staff noted that the benefit of controlled venting occurs for sequences involving successful venting, and that these sequences are not affected by reducing the operator

failure to vent. In response to an RAI, Entergy performed a revised evaluation by crediting continued vessel injection from LPCI or Core Spray for those sequences in which torus venting is successful and alternative injection systems fail after torus venting. Since the available net positive suction head (NPSH) is likely to be less than the required NPSH with the vent open, a failure probability of 0.9 was assigned for this new success path. The PSA model change resulted in about a 3 percent reduction in CDF, a 5 percent reduction in population dose, and a benefit (including the impact of uncertainties) of approximately $387,000. Entergy concluded that this SAMA is potentially cost-beneficial for PNPS provided the existing torus vent path, valves, and controls do not require hardware modification (Entergy 2006c).

The NRC staff also asked the applicant to provide an evaluation of the costs and benefits of converting the vent system to a passive design. In response, Entergy evaluated a new SAMA that would involve modifying the air operated valves and the associated solenoid valves so that the valves fail open on loss of air and nitrogen or on loss of power. Entergy estimated that this modification would result in a CDF and population dose reduction of about 14 percent, and a benefit (including the impact of uncertainties) of $1.2 million. However, Entergy estimated the cost of implementing this SAMA to be approximately $3.1million (Entergy 2006b). Therefore, this new SAMA would not be cost beneficial at PNPS.

- Phase II SAMAs 57 and 59, which are procedural and hardware modifications, respectively, were identified as potential SAMAs to further reduce the risk contribution from two basic events – FXT-XHE-FO-V4T2, operator fails to align fire water crosstie for reactor pressure vessel via LPCI, and FST-XHE-FO-DWS, operator fails to align fire water cross-tie for drywell spray. The NRC staff noted that these SAMAs may not effectively address the basic events, which are operator errors. Therefore, the NRC staff asked the applicant to identify and evaluate other SAMAs that might lower the importance of these events. In response, Entergy evaluated a new SAMA that would involve changing an existing removable spool piece to permanent piping and providing the capability to open locked-closed manual valves remotely from the control room. These modifications would increase the success probability of the actions to align fire water to the LPCI injection path. Entergy estimated that this modification would result in a CDF reduction of less than 3 percent, a population dose reduction of 4 percent and a benefit (including the impact of uncertainties) of approximately $310,000. Entergy estimated the cost of implementing this SAMA to be almost $3 million (Entergy 2006b). Therefore, this new SAMA would not be cost beneficial at PNPS

The NRC staff noted that for certain SAMAs considered in the ER, there may be alternatives that could achieve much of the risk reduction at a lower cost. The NRC staff asked the applicant to evaluate several lower cost alternatives to the SAMAs considered in the ER,

including SAMAs that had been found to be potentially cost-beneficial at other BWR plants. These alternatives included: (1) the use of a redundant diesel fire pump for core injection, (2) the use of a portable generator to power the battery chargers, (3) provide cables from diesel generators to directly power battery chargers, (4) use portable generator to provide alternate DC feed to panels supplied only by DC bus, and several additional alternatives (NRC 2006a). Entergy provided a further evaluation of these alternatives, as summarized below.

- Use of a redundant diesel fire pump for core injection (in lieu of a diverse injection system considered in Phase II SAMA 45) - Based on a bounding analysis in which failures of the diesel fire pump to start and run were set to zero, this alternative was estimated to result in a CDF reduction of about 4 percent, a population dose reduction of 8 percent and a benefit (including the impact of uncertainties) of $650,000. However, Entergy estimated the cost of implementing this SAMA to be approximately $5.5 million (Entergy 2006b). Therefore, this new SAMA would not be cost beneficial at PNPS.

- Use of a portable generator to power the battery chargers - In response to the NRC staff's inquiry regarding use of a portable generator, Entergy stated that an existing 400 kilowatt security diesel generator could be used to extend the life of both 125 VDC batteries. To assess the benefit, the probability of non-recovery of off-site power for 14 hours was increased to 24 hours. This resulted in a benefit (with uncertainties) of approximately $212,000 (Entergy 2006b). Entergy estimated the cost of implementing this SAMA to be $75,000. Entergy concluded that this low-cost alternative is potentially cost-beneficial for PNPS.

- Provide cables from diesel generators to directly power battery chargers, and use portable generator to provide alternate DC feed to panels – Entergy indicated that these SAMAs do not address the dominant DC-related failures for PNPS. Also, Phase II SAMA 34 (which was identified as potentially cost-beneficial in the baseline analysis) and the additional, potentially cost-beneficial, alternative discussed above adequately address the issues regarding DC power reliability.

- Entergy indicated that the remaining low cost alternatives are either already addressed by existing plant procedures or by a Phase II SAMA.

The NRC staff notes that all of the potentially cost-beneficial SAMAs identified in either Entergy's baseline analysis or uncertainty analysis are included within the set of SAMAs that Entergy plans to further evaluate. However, two additional potentially cost-beneficial SAMAs were identified as a result of the NRC staff review: (1) SAMA 53, control containment venting within a narrow pressure band and (2) a new SAMA, use the security diesel generator to extend

the life of the 125 VDC batteries. These SAMAs should also be included in the set of SAMAs to be further evaluated by Entergy.

The NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

G.7 Conclusions

Entergy compiled a list of 281 SAMAs based on a review of: the most significant basic events from the plant-specific PSA, insights from the plant-specific IPE and IPEEE, Phase II SAMAs from license renewal applications for other plants, and review of other NRC and industry documentation. A qualitative screening removed SAMA candidates that (1) were not applicable at PNPS due to design differences, (2) had already been implemented at PNPS, or (3) were similar and could be combined with another SAMA. Based on this screening, 222 SAMAs were eliminated leaving 59 candidate SAMAs for evaluation.

For the remaining SAMA candidates, a more detailed design and cost estimate was developed as shown in Table G-4. The cost-benefit analyses showed that five of the SAMA candidates were potentially cost-beneficial in the baseline analysis (Phase II SAMAs 30, 34, 56, 57, and 58). Entergy performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment. As a result, no additional SAMAs were identified as potentially cost-beneficial in the ER. Entergy has indicated that the potentially cost-beneficial SAMAs have been submitted for engineering project cost-benefit analysis. The NRC staff concluded that all of these SAMAs are potentially cost-beneficial. In addition, as a result of the NRC staff review, Entergy concluded that two additional SAMAs are also potentially cost-beneficial, i.e., control containment venting within a narrow pressure band, and use the security diesel generator to extend the life of the 125 VDC batteries.

The NRC staff reviewed the Entergy analysis and concludes that the methods used and the implementation of those methods was sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and inclusion of a multiplier to account for external events. In addition, as described in Section G.2.3, in view of small impact of the additional considerations raised in PW's contention on estimated SAMA benefits, the NRC staff reaffirms its original conclusion

that the methodology used by Entergy to estimate the offsite consequences for PNPS provides an acceptable basis from which to proceed with an assessment of candidate SAMAs.

The NRC staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff agrees that further evaluation of these SAMAs by Entergy is warranted. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to Title 10 of the *Code of Federal Regulations*, Part 54.

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Docket No. 50-293

11. ABSTRACT *(200 words or less)*

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted by Entergy Nuclear Operations, Inc. (Entergy), a subsidiary of Entergy Corporation, to the NRC to renew the OL for Pilgrim Nuclear Power Station (PNPS) for an additional 20 years under 10CFR Part54. This SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewal for PNPS are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2)the Environmental Report submitted by Entergy; (3) consultations with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

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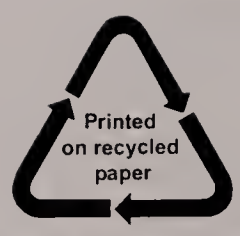

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